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MODEL Airplane NEWS

LEARN TO FLY WITH THIS MUSTANG!

Basic Training & Beyond

Hangar 9 Mustang PTS

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Mark M2.10 engine

BECOME A SHOW PILOT

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October 2005

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> ON THIS PAGE: the Kondor Model Products B-25J Mitchell.

BY DEBRA CLEGHORN

A warbird trainer?

WITHOUT A DOUBT, LEARNING TO FLY IS THE SINGLE GREATEST HURDLE to becoming involved in our sport. That said, a gentle, stable (and durable!) trainer is a new pilot's best friend: mastering the basics of RC flight is exponentially easier if your plane is designed to turn slowly, recover easily from wrong inputs and land gracefully.

Unfortunately, planes that are designed to have these characteristics look ... well, like trainers, and as soon as they can, new pilots want to "trade up" to a plane that looks more exciting and is more fun to fly. But wait; the latest release from the folks at Hangar 9 will change the flying field forever! With their Mustang Progressive Training System (PTS), beginners can actually learn to fly with a great-looking warbird. How did they do it? They added airbrakes, locked-down flaps and clear plastic anti-spin droops to make this ARF an ideal trainer; remove these accessories, and you can take your flying to the next level! Check out our exclusive in-depth review on page 40 to see what else this impressive training package has to offer. Truly, there has never been a better time to earn your wings.

When it comes to power output, is bigger always better? Not necessarily. Our review of the Mark Model Engines M2.10 engine may just change the way you think about big-block powerplants: this 35cc glow engine can keep up with a 50cc gasser! Get the inside scoop on page 122. Electric-power enthusiasts have something to cheer about, too, in the new $85 universal charger from Multiplex. The affordable LN-5014 Multicharger charges and discharges Ni-Cd, NiMH, Li-poly, Li-ion and even lead-acid batteries. Check out our detailed review on page 113 for more details.

If you're on the lookout for a fall or winter building project, don't miss our featured construction article: a gorgeous, giant-scale Shoestring Yellow Jacket. Designed by Bud Roane, this sport plane is very aerobatic and a joy to fly. With its traditional balsa-and-ply construction and flat tail surfaces, you'll have this beauty airborne and rounding the pylons in no time.

Judging by conversations overheard at some flying fields, you might think that helicopters and airplanes are like oil and water: they just don't mix. That couldn't be further from the truth, as evidenced at the Extreme Flight Championships this summer in Troy, OH. Sponsored by Futaba, this 3D aerobatics invitational showcases the talents of the hottest helicopter and giant-scale airplane pilots performing routines that made the crowd go wild! The *Model Airplane News* crew was there in force, enjoying the show and, of course, capturing the action on film (megapixels, actually). After you read our coverage, we think you'll agree that helicopters and fixed-wing aircraft make a great combination.

Safe landings.

Debra Cleghorn

Executive Editor

MODEL Airplane NEWS
Est. 1929

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BUILDING A REALISTIC SCALE WARBIRD IS HARD...

...SO LET HANGAR 9 DO IT FOR YOU

Hangar 9's P-47D Thunderbolt "Razorback" 150 ARF is based on a full-size warbird flown in World War II combat by Captain Herschel "Herky" Green, the charismatic commander of the 317th Fighter Squadron, 15th Air Force. Scale detailing is spot on, right down to the iconic #11 on the "jug," the combat-ready "Razorback" fuselage and a period-authentic UltraCote® scheme. Other realistic scale details include the molded air scoops and vents, greenhouse canopy, molded fiberglass wing fillets, belly tank, bombs, display propeller and functioning flaps that improve landing performance.

HAN2700
Wingspan: 81.25 in
Length: 69.5 in
Wing Area: 1164 sq in
Weight: 15-17 lb
Radio: 6 channels w/10 servos
Engine: 1.20-2.10 2-stroke
1.20-2.00 4-stroke
23-26cc gas

Speaking of touchdowns, this Thunderbolt sports all-new heavy-duty UltraTract™ metal retracts designed for easy setup, scale looks and trouble-free operation, flight after flight. Heat-treated Oleo struts include built-in shock absorbers for gentle landings.

Assembly is no problem for any skilled modeler. You want an exceptionally photo-realistic scale warbird that flies great and is easy to maintain? Engage in enemy combat with the P-47D Thunderbolt 150 ARF from Hangar 9®.

HANGAR 9

Hangar 9's revolutionary heavy-duty UltraTract retracts include Oleo struts and built-in shock absorbers that are able to soak up many heavy landings. The retract servos are integrated with the sturdy metal retract, allowing for a short linkage that's easy to set up.

The large hatch provides easy access to the spacious radio compartment. Interior components can be conveniently rearranged for optimal balancing with a wide variety of engines.

"I hope your magazine will continue to highlight beautiful scratch-built planes ..."

THE ART OF MODELING

I hear a lot of folks lamenting that it seems our hobby has become nothing but ARFs, but one look at the *Model Airplane News* September 2005 cover and at the "Top Gun '05" article is proof that scratch-building and scale modeling are alive and well. My compliments to the talented master craftsmen and pilots who competed at Top Gun this year, as well as to the folks at *Model Airplane News* for this inspirational feature. I hope your magazine will continue to highlight beautiful scratch-built planes because they show all of us "ARF'ers" what's possible if we hone our building skills and are willing to spend our time and creativity on a project. [email]

DAN ZACHARIA

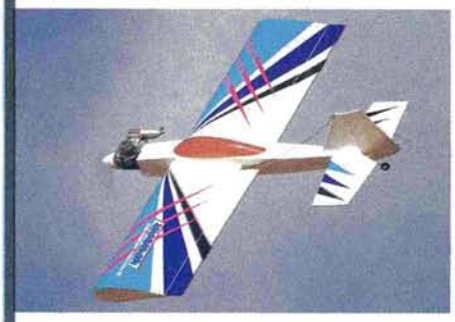
Well said, Dan. Rest assured that Model Airplane News *will continue to feature museum-quality model planes as well as sport scratch-built projects, such as those you'll find in many of our construction articles. Thank you for your email.* DC

REMOVABLE WINGS

I just finished reading your review of the Tower Hobbies Uproar ARF in the May 2005 issue. I enjoy reading about the construction of all models and am writing in regard to the photo on page 66. It shows how the radio components fit inside the fuselage below the wing, but the wing is then glued on. How do you get to these components after the wing is epoxied into place? Is there a hatch on the belly that is not shown in the photos?

RICHARD SCHERER
SCAPPOOSE, OR

Richard, thanks for asking. In the photograph where the wing is being attached to the fuselage, you cannot see the hatch. Fortunately, the ARF includes an excellent-fitting hatch that is attached with screws and provides complete access to all of your radio components. You won't have



a problem performing preflight checks or preventive maintenance. The following excerpt from the article provides a little more information.

"Radio installation. Access to the radio compartment is through a hatch at the bottom of the plane. The removable hatch also includes two cutouts that I used to install a switch and a battery-charging jack. Install the servos in the fuselage as instructed, and then attach the control rods with the provided hardware."

Since this article came out, I've put many flights on my Uproar. It's a very sturdy plane and an excellent fun flyer that is quite capable of extreme aerobatics. So far, so good, and thanks to Tower's thoughtful planning, we can access our radio gear before *that first crash.* **John Stewart**

SEALING HINGES

I fly a 90-size Funtana with a 100 Saito 4-stroke. My flying buddies recommend that I seal the hinges on this big aircraft, but I can't find any literature on this subject. Can you please help? [email]

K. KAUFMAN

Sealing the hinge gaps on larger planes helps reduce the airflow through the gap, and that, in turn, reduces the chance for control-surface flutter and provides a more responsive control surface. You can seal the hinge line with something as simple as clear tape, but I like to use heat-shrink covering because it creates a tight seal and provides a fuelproof finish.

If you'd like to try this for your hinges, purchase a roll of your favorite clear covering. Cut a piece that is wide enough to span the entire hinge gap; for example, if you're working on the ailerons and they are beveled at a 45-degree angle, you might have 1 inch of bevel on the wing and 1 inch of bevel on the aileron. Cut the clear covering 2 inches wide by the length of the aileron. Fold the heat-shrink covering over on itself, and put a nice, crisp crease through the middle of its width. Remove the backing paper, and place the strip into the hinge gap on the underside of the control surface so that the crease will follow the hinge line.

Set the covering iron to low heat, and tack down the covering crease using the point of the iron. After the crease is tacked down for the full length of the aileron, start working from the middle out to the edges, and iron down the rest of the covering to both sides of the hinge line. You need only seal one side of the hinge line. Do the same thing to all the other control surfaces, and you're finished. That's all there is to it! **JR**

WRITE TO US! WE WELCOME YOUR COMMENTS AND SUGGESTIONS. LETTERS SHOULD BE ADDRESSED TO "AIRWAVES," *MODEL AIRPLANE NEWS*, 100 EAST RIDGE, RIDGEFIELD, CT 06877-4606 USA; EMAIL MAN@AIRAGE.COM. LETTERS MAY BE EDITED FOR CLARITY AND BREVITY. WE REGRET THAT, OWING TO THE TREMENDOUS NUMBERS OF LETTERS WE RECEIVE, WE CANNOT RESPOND TO EVERY ONE.

ILLUSTRATIONS BY RICHARD THOMPSON

EZ grab

It can sometimes be very difficult to remove servo plugs from a receiver, as the thin plugs fit tightly and are hard to grab. Make a 90-degree bend in the tips of a pair of tweezers; this will make a tool that can securely grasp the plug.

Richard Piccola, Cartersville, GA

Stretching the limits

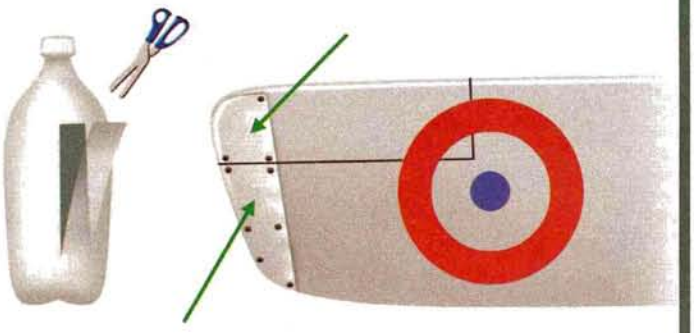
A lot of tail-dragger models use a pull-pull spring system between the rudder control horns and the steering tiller. The springs may break or fall off and cause the aircraft to handle poorly on the ground. Here's a foolproof spring replacement: install 2-56 ball links on the tiller and rudder horns, and between them, secure a short length of millinery elastic (available at any fabric store). Stretch the elastic a bit so that it is slightly under tension, loop the ends around the ball link, and secure them with small zip-ties and a couple of drops of thin CA. Use 1/8-inch-diameter elastic for giant-scale models and 3/32 diameter for smaller models.

Charles Barsony, Brantford, Ontario, Canada

Wingtip protection

Narrow-track models like WW I biplanes are prone to drag a wingtip during ground maneuvers. If you fly from a paved runway, you know how quickly the pavement can abrade the covering. To prevent this, make skidplates out of empty, 2-liter clear soda bottles. Cut a portion that matches the shape of your wingtip, and secure it with small wood screws. The skidplates will be almost invisible, and when they wear out, they can be replaced easily.

Fatih Turna, Kocaeli, Turkey



Real instrument panels

Check your back issues of *Flight Journal* for glossy photos of full-size airplanes' instrument panels. Clip and glue one of these pictures into your latest model; if the model has an open cockpit, fuelproof it. Decorate the faux instrument panel with a few knobs and switches, and it will look convincingly real!

David C. Best, Springfield, OH

SEND IN YOUR IDEAS. *Model Airplane News* will give a free, one-year subscription (or a one-year renewal, if you already subscribe) for each idea used in "Tips & Tricks." Send a rough sketch and a brief description to *Model Airplane News*, 100 East Ridge, Ridgefield, CT 06877-4606 USA. BE SURE THAT YOUR NAME AND ADDRESS ARE CLEARLY PRINTED ON EACH SUBMISSION. Because of the number of ideas we receive, we can neither acknowledge each one nor return unused material.

PROJECT OF THE MONTH

*Sopwith Triplane

Andre Blais
Penticton, BC, Canada

Originally intended for electric flight, this Peter Rake plan has been modified to house an O.S. FS-26 4-stroke engine and a 10x5 prop. Andre also reengineered the elevator and stabilizer. Other features include Williams Bros. wheels, a scratch-built Vickers gun (made of balsa, plastic tubing and paper) and a remote glow starter. Andre covered his Sopwith Triplane with Antique and Dark Green CoverLite to commemorate the famous "B" Flight Black Naval Squadron 10's color scheme. His Triplane has a wingspan of 45 inches and weighs 5 pounds.

<DG-800S

Larry Bennington
Eden, UT

Scratch-built with a 16.4-foot wingspan and weighing 10.5 pounds, this giant sailplane is quite a sight! Larry's DG-800S has sheeted, built-up wings with flaps, spoilers and retractable wheels. He also scale-hinged a 22-inch canopy by forming oven-heated clear plastic over a fiberglass mold. Larry's model features interchangeable wingtips that allow the DG-800S to fly with either a 15- or an 18-meter wingspan.

>The "Black" Red Zephyr

Edward Martin
Asheville, NC

Designed by Herb Greenberg almost 70 years ago, this Ben Buckle Kit is powered by a Magnum .52 4-stroke XL engine, a 12x5 K-series Master Airscrew prop and Futaba electronics. Edward says that his Red Zephyr "... is a very stable flyer and always attracts attention at the fly-ins." This model sports Trexler balloon wheels and Fibafilm covering, both of which add to its vintage appearance.

>Great Planes ⅓-scale CAP 580

Richard Javery
Warren, MI

Taking a break from his duties as an RC flight instructor and model designer and scratch-builder, Richard gave the Great Planes CAP 580 a try. After roughly two weeks of construction, his 580 "flew like a dream." He tells us that it's "... a very stable flyer and required no trim adjustments on the first flight." He modified the ARF by adding brass inserts to the model's stab for strength, which also makes it convenient to remove the stab for transportation purposes. He powers his model with a DA-100 engine that allows more vertical maneuvering. Well done, Richard!

^Sommer Monoplane

Bob Kelley
Middleburg, FL

Built according to Wally Zober drawings, this beautiful French racer has a wingspan of 80 inches and, according to Bob, "... is an excellent example of aviation from the early days of WW I." He powers his model with an O.S. 240 twin engine and C&H ignition. Bob refers to his model as a "... smooth flyer with scale sound and speed." Gorgeous replica, Bob!

<Alon Aircoupe

Darren Gibson
Eau Claire, WI

This low-wing monoplane was built from a Jack Stafford Models kit. Detailed to resemble a full-scale Ercoupe that Darren once flew in, this Aircoupe was finished using Silver UltraCote to resemble the scale version's all-metal construction. Darren powers his model with a Futaba FP-T7UAP radio and SuperTigre GS-45 engine, and he included a pilot by Hangar 9.

SEND IN YOUR SNAPSHOTS. *Model Airplane News* is your magazine, and we encourage reader participation. In "Pilot Projects," we feature pictures from you—our readers. Color slides and color prints are acceptable, but please do not send digital printouts or Polaroid prints. Emailed submissions must be at least 300dpi. We receive so many photographs that we are unable to return them. *Each month, one pilot's project will be selected as the "Project of the Month" and will be eligible for a grand prize of $500, to be awarded at the end of the year. The winner will be chosen from among the published "Project of the Month" selections, so send us a photo and a brief description without delay! Send entries to "Pilot Projects," *Model Airplane News*, 100 East Ridge, Ridgefield, CT 06877-4606 USA.

AERO TECHNOLOGIES
TUMBLEWEED 3D ARF

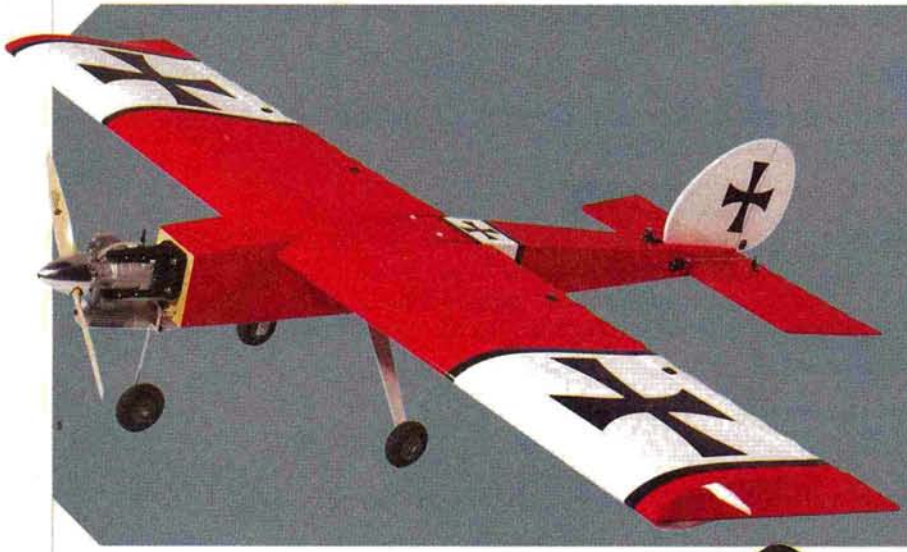
Want to spend less time at your workbench and more time perfecting 3D maneuvers? Check out the Tumbleweed 3D. Constructed of select balsa and plywood and covered with UltraCote, the Tumbleweed 3D can be assembled quickly, thanks to its NexGen ARF assembly. All the major components come assembled with ailerons, rudder and elevators hinged and glued and with control horns ready to hook up. A two-piece, plug-in wing and flying stab make transporting it to the field a breeze. Of course, a painted fiberglass cowl, composite landing gear with wheels and fiberglass wheel pants and a complete hardware package round out this beauty. Specs: wingspan, 69⅛ in.; wing area, 1,122 sq. in.; length, 66⅝ in.; weight, 11 lb. ; engine req'd, .91 to 1.40 2-stroke or 1.20 to 1.80 4-stroke; radio req'd, 6-channel computer transmitter with 6 servos (5 high-torque).
Atec Models (863) 709 8088; atecmodels.com.

GREAT PLANES
COSMIC WIND MINNOW

Designed for intermediate-level pilots, this RC Formula One ARF flies as good as it looks. It features a fiberglass fuselage, a mid-mounted symmetrical wing for excellent flight performance at low and high speeds, a steerable tailwheel and faired pushrod exits. The Minnow's sheeted, built-up balsa and ply wing halves and tail surfaces are covered in MonoKote, and the fiberglass fuselage, cowl, wheel pants and aluminum landing gear are factory-painted to match. A clear canopy, scale aluminum spinner, decals and Great Planes hardware are all supplied. Specs: wingspan, 63 in.; wing area, 775 sq. in.; weight, 7.25 to 8.25 lb.; wing loading, 21.5 to 24.5 oz./sq. ft.; length, 67.5 in.; engine req'd, .61 to .91 2-stroke or .91 4-stroke; radio req'd, 4-channel w/5 servos.
The Cosmic Wind Minnow costs $350.
Great Planes Model Mfg. (217) 398-6300; (800) 682-8948; greatplanes.com.

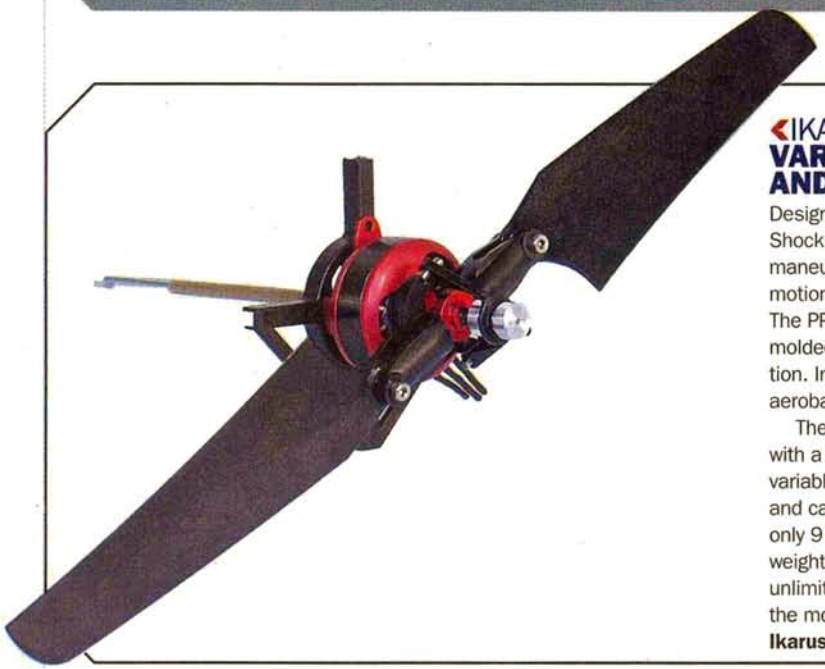
MODEL RECTIFIER CORP.
SUPER BRAIN 977 CHARGER

The new Super Brain 977 charger from MRC gives new meaning to the term "user-friendly." This charger is feature-rich at a very affordable price. Using MicroPeak technology, the Super Brain can safely and effortlessly charge and discharge 1- to 9-cell Ni-Cd and NiMH battery packs as well as 1- to 3-cell lithium-ion and lithium-polymer batteries. Drawing from a big 10A AC or DC power supply, the Super Brain 977 is fan-cooled and can simultaneously charge and discharge dissimilar battery packs. The large LCD screen provides a wealth of information such as battery status, charge rate, battery voltage, peak threshold in millivolts, number of cells, capacity in milliamp hours and the total accumulated charging time in minutes. Charging rates are from 0.2 to 5 amps in 0.1A increments. Discharge rates are from 0.2 to 4 amps in the same 0.1A increments. The Super Brain 977 is priced at only $109.98.
MRC (732) 225-2100; modelrec.com.



<GREAT PLANES
GIANT BIG STIK ARF

Whether powered by a gas or glow engine, the Giant Big Stik ARF is an exciting performer that can loop, spin, fly inverted and perform stall turns until your thumbs are tired. It even has flaps for added maneuverability. The Giant Big Stik's strong balsa and ply airframe is expertly covered in MonoKote and can be flight-ready in just 10 to 15 hours. It also features Great Planes hardware and a two-piece wing. Specs: wingspan, 80.5 in.; wing area, 1,520 sq. in.; weight, 13 to 15 lb.; wing loading, 20 to 23 oz./sq. ft.; length, 54.5 in.; engine req'd, 1.20 to 1.60 2-stroke, 1.20 to 1.80 4-stroke, or a 25 to 35cc gas; radio req'd, 4- to 5-channel w/7 or 8 servos. The Giant Big Stik costs $340.
Great Planes Model Mfg. (217) 398-6300; (800) 682-8948; greatplanes.com.



<IKARUS USA
VARIABLE-PITCH PROPELLER AND S2 BRUSHLESS MOTOR

Designed for extreme 3D flying, this propeller allows you to fly a Shock Flyer or another 3D profile RC airplane straight for a wall maneuver and then pull reverse pitch; the plane will stop its forward motion and then back up from the wall without changing attitude. The PPS-4D uses a special 3D airfoil that is constructed of precision molded parts and incorporates six ball bearings for smooth operation. Install this new variable-pitch propeller, and make your next aerobatic maneuver a heart-pounding adrenaline rush.

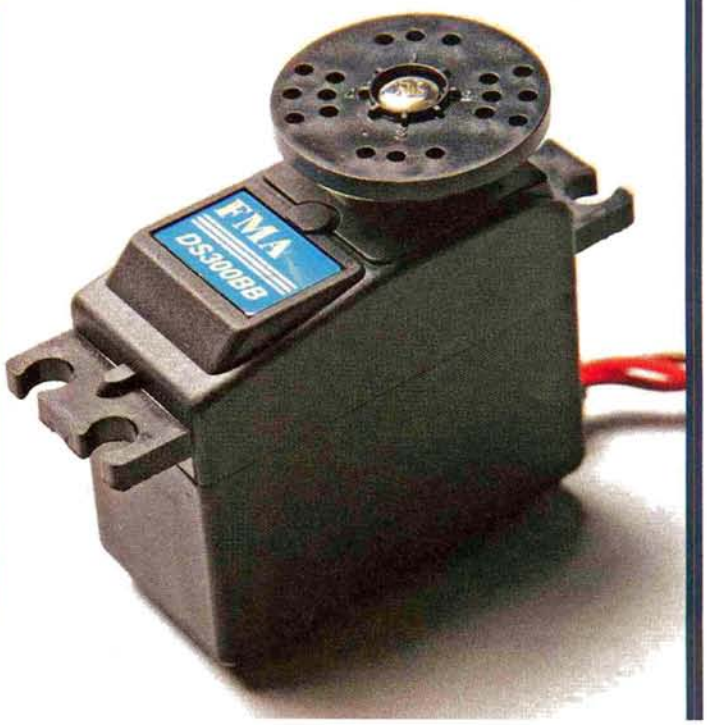
The new S2 brushless motor features an integrated prop saver with a hollow main shaft that's perfect for the new Ikarus PPS-4D variable-pitch prop. This motor is suitable for 3-cell Li-poly batteries and can develop an astounding 410 grams of thrust while pulling only 9 amps. This battery/motor combination can provide a lightweight Shock Flyer with an amazing 1:2 thrust ratio. Talk about unlimited vertical performance! The PPS-4D propeller costs $48; the motor costs $89; and the combo sells for $129.
Ikarus USA (239) 690-0003; ikarus.net.

>FMA DIRECT
DS300 DIGITAL ADJUSTABLE SERVOS

Like most digital units, FMA Direct's new DS300 Digital Adjustable Servos provide high speed, high torque and terrific holding power. What's unusual about the DS300s is that you can set them up and fly them without any special equipment. You don't even need a computer radio!

The DS300 replaces tedious trial-and-error linkage adjustments with "finger programming." Install the servo, put it in Setup Mode and then program the control surface's center point, endpoints and reversing simply by moving the servo arm with your fingers. The servo will remember those settings, thereby giving you the ease of "model memory" without the expense of a computer radio. With up to 70 oz.-in. of torque and speeds as low as 0.12 second, the DS300 can be used in a wide variety of aircraft. A built-in digital filter reduces radio noise and provides smoother response to small stick movements, so the DS300 consumes less power than standard servos. The DS300 is a wide-voltage servo that can be driven by 2.5 to 12.6 volts, and this makes it ideal for use with lithium-polymer packs.

Two Digital Adjustable Servo models are available: a 1.6-ounce model for $42.95 and a 2-ounce model for $42.95.
FMA Direct (800) 343-2934; fmadirect.com.



PHASE 3
CHIPMUNK 370 RTF

Inspired by airshows around the world, the new Phase 3 Super Chipmunk offers aerobatic performance for intermediate and advanced pilots. This RTF kit is molded of tough, lightweight, skinned foam that makes the fuselage light and strong. The one-piece wing is hollow-core shaped foam with an internal spar running through it. This provides the lightweight strength necessary for a high-performance aircraft. The kit includes a direct-drive 370 motor and a 600mAh NiMH 8.4V battery with both an AC input and a fast DC input charger to use at the field. Specs: wingspan, 32 in.; wing area, 190 sq. in.; length, 25 in.; weight, 12.5 oz.; price, $149.99.

Phase 3; distributed exclusively by Global Hobby Distributors (714) 963-0329; globalhobby.com.

EAGLE TREE SYSTEMS
NEW WIRELESS TELEMETRY TOOLS

When we reviewed the Seagull Wireless Telemetry System in March 2005, we thought it was the coolest thing since sliced bread. But the engineers at Eagle Tree didn't rest on their laurels, and now they're introducing three cool new tools: a Glide Variometer and Telemetry System for soaring pilots; a GPS Expander Module for the Eagle Tree Recorder and Telemetry systems; and a Pro Wireless Flight Data System and Pro Flight Data Recorder. Eagle Tree's extremely small, light systems are packed with special features and provide real-time flight data as well as info you can analyze to improve your plane's flight performance.

Eagle Tree Systems LLC (888) 432-4744; (425) 614-0450; eagletreesystems.com.

HOBBY LOBBY
F-86 SABRE DUCTED-FAN JET

Hobby Lobby has just released a new F-86 ducted-fan jet from Alfa Models. This hollow, molded-foam plane has a tough external layer that resists dings. The area that makes ground contact during landings is covered in plastic for greater durability. The wing is removable for easy access to the ducted-fan unit as well as for easy transportation. The ducted fan is included, and the ailerons come hinged and installed. Specs: wingspan, 29.5 in.; wing area, 201 sq. in.; length, 29.25 in.; weight, 16.5 oz.; price $169.

Hobby Lobby Intl. (615) 373-1444; hobby-lobby.com.

'05

EXTREME FLIGHT CHAMPONSHIPS

THE ULTIMATE 3D AIRCRAFT AND HELICOPTER CHALLENGE

BY DEBRA CLEGHORN & GERRY YARRISH
PHOTOS BY DEBRA CLEGHORN & GERRY YARRISH

Team Futaba was out in force, and plenty of support was available at the Great Planes booth. Left to right: David Johnson, Greg Meyer and Kevin Burner.

The overall winner in the Aircraft category was this impressive Quique Aircraft Yak 54 ARF flown by Andy Jeskey. Powered by a DA-100 twin-cylinder gas engine, the Yak was a showstopper!

Left: there were a whole lot of Fury 3Ds in the heli pit area! Right: flown by Mike Fadley, this Miniature Aircraft Fury sits still long enough in inverted flight for us to get an in-focus shot! Straight and level did not last very long in any of the flight routines.

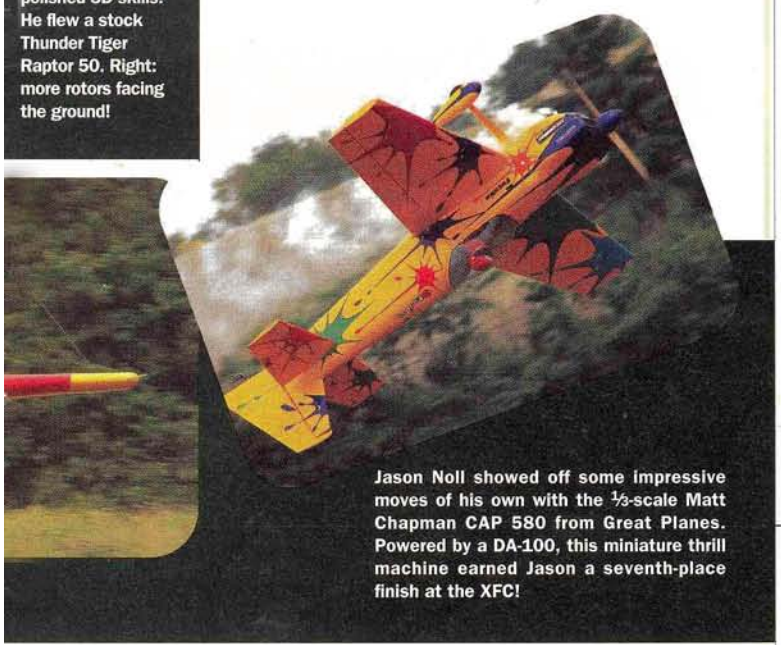
Above, left and right: Matt Chapman was the man of the hour with his full-size CAP 580. He even duplicated some of the RC pilots' moves!

Left: the man to beat in the Helicopter arena: Curtis Youngblood. Right: Curtis's weapon of choice was this .90-size JR Vibe, captured here just as it settled onto the mat from which he began his flight routine.

ASSEMBLE THE WORLD'S BEST RC AIRPLANE AND HELICOPTER PILOTS,

outrageous 3D aerobatics choreographed to music and more than $10,000 in cash and prizes and what do you get?—a rockin' good time at the International Extreme Flight Championships! Sponsored by Futaba and hosted by the Waco Historical Society at the Waco Field airport in Troy, OH, the 2005 "XFC" invited 42 of the world's best pilots to strut their stuff for the crowd and challenge one another for bragging rights. You might think that giant-scale aerobats wouldn't mix well with unlimited helicopters, but it's a great combination that keeps the audience interested and gives pilots of each stripe a breather. When XFC committee members Wendell Adkins, Bill Cline and Frank Noll Jr. came up with this idea four years ago, they knew they had a winner!

Left: Alan Szabo took second in Helicopters with his Thunder Tiger Raptor .90—awesome! Center: 9-year-old Kyle Stacy impressed everyone with his polished 3D skills. He flew a stock Thunder Tiger Raptor 50. Right: more rotors facing the ground!



Jason Noll showed off some impressive moves of his own with the ⅓-scale Matt Chapman CAP 580 from Great Planes. Powered by a DA-100, this miniature thrill machine earned Jason a seventh-place finish at the XFC!

THE EVENT

Although the pilots' 4-minute routines are considered "freestyle" in that they can express their creativity and originality in their performance, they are judged by a panel of experts on their aerobatic precision, choreography and presentation. The pilots are also required to set their routines to music of their choosing, so how well their routines work with the music is also evaluated. On Friday and Saturday, each pilot performs two routines: one is made up of maneuvers entirely of the pilot's choosing (unknown to the judges), and the other includes certain required maneuvers (known to the judges). On Sunday, the top seven helicopter and top seven fixed-wing pilots pulled out all the stops to compete for the cash.

THE TOOLS OF THE TRADE

For the aircraft portion of the XFC, the models must be scale replicas of full-size planes used in aerobatics competition. In keeping with IMAA rules, wingspans must be at least 80 inches for monoplanes and 60 inches for biplanes. There must be a pilot figure in the cockpit, and there is a 55-pound weight limit. The vast majority of the aircraft in this year's event were in the 35- to 40-percent size range, and all used twin-cylinder gas engines.

The helicopters are state of the art, and almost all were .90 size. Composite rotor blades, heading-lock gyros and engine governors are mandatory equipment. The machines that made it to the winners' podium were two JR Vibes (Curtis Youngblood and Scott Gray) and a Thunder Tiger Raptor flown by Alan Szabo. All three used powerful O.S. .91 engines that were outfitted with OMI Viper engine heads.

IN THE AEROBATICS ARENA

Each competitor has 2 minutes to start his engine and get into the air, and he can start his 4-minute flight when the plane leaves the air or in midair (signaled by the pilot's caller). The flight judging ends after 4 minutes, even if the routine isn't finished. If the model touches the ground at all before the 4 minutes are up, the flight and scoring end. At the end of the flight, the pilot has 1 minute to land and clear the runway for the next contestant! The known aircraft routines include three high-end competition maneuvers: the Humpty Dumpty Bump, the Snappy Loop and the Ratchetty Roll. The helicopter known maneuvers included aerial antics such as vertical ¾ rolls with tic-toc, pirouetting vertical figure-8s and vertical down-roll reversing figure-S's. All heli flights started from the ground.

Allowing the contestants to work the known maneuvers into their freestyle sequence guarantees that every flight is as exciting as the next; no repetitive routines here!

Manuel Santos's motto says it all! Team Mexico was proud of his 12th-place finish.

Flying this 3W100-powered Carden Aircraft Extra, Chris Fry finished in ninth place.

Third-place finisher Kelly Gerber also flew this Aeroworks Extra 330 with an impressive smoke system.

AIRCRAFT WINNERS

Place	Name	Aircraft	Engine	Radio	Fuel
1	Andrew Jeskey	102-in. Quique Aircraft Yak 54	DA-100	JR	Gas
2	John Glezellis	130-in. PL Products Extra 330	DA-150	Futaba 14MZ	Gas
3	Kelly Gerber	123-in. Dalton Aircraft Edge 260	DA-150	Futaba 14MZ	Gas

HELI WINNERS

1	Curtis Youngblood	JR Vibe 90	O.S. .91	JR 10X	Wildcat
2	Alan Szabo	Thunder Tiger Raptor 90	O.S. .91	Airtronics Stylus	Powermaster
3	Scott Gray	JR Vibe 90	O.S. .91	JR 10X	Cool Power

Eighth-place finisher Yuri Higuchi made an excellent showing with his Extra 330. Check out his tidy equipment installation below!

HALFTIME THRILLS

Matt Chapman of Kennett Square, PA, was the highlight of the halftime show as he flew formation with Frank Noll Jr. Matt piloted his full-size 360hp CAP 580, and Frank flew the new Great Planes 1/3-scale Matt Chapman 580. You don't see that every day! After the formation demo, Matt—addressing the crowd over the PA system—presented his own blend of precision flying mixed with some wild airshow routines. He finished by flying several of the mandatory maneuvers that the RC pilots were required to perform, and he pulled them off with style.

Whether you like your action with fixed wings or high-speed rotors, the XFC was an amazing showcase of pilot skill. Add music and a whole lot of precision, and you have a must-see event. See you next year!

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SPECIFICATIONS

MODEL: Mustang PTS
MANUFACTURER: Hangar 9
DISTRIBUTOR: Horizon Hobby Inc.
TYPE: fun-scale trainer
WINGSPAN: 58.25 in.
LENGTH: 50 in.
WING AREA: 627 sq. in. w/droops
WEIGHT: 6.5 to 7 lb.
WING LOADING: 23.9 oz./sq. ft. at 6.5 lb.
RADIO REQ'D: 4- to 5-channel (throttle, rudder, elevator, aileron); flaps optional
PRICE: $399.99

COMMENTS

Everything is included in one attractive package for learning basic flight to advanced sport maneuvers. The flight envelope is stretched in both directions with this one!

HIGHLIGHTS

- Great looks
- Very complete package
- Great quality and craftsmanship
- Impressive trainer flight performance
- Unique Progressive Training System
- Flight sim included
- Good ground handling

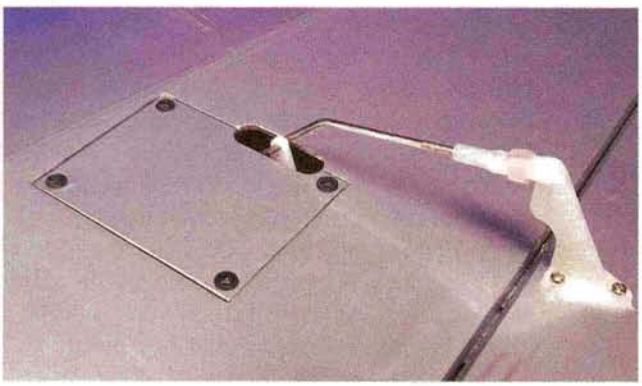
THE PTS SYSTEM

The new P-51 Mustang PTS (Progressive Training System) is a special trainer plane that allows you to go from learning the very basics of RC flight all the way up to advanced aerobatic performance without having to purchase another model. This is made possible by some clever add-ons that help control the model's flight characteristics.

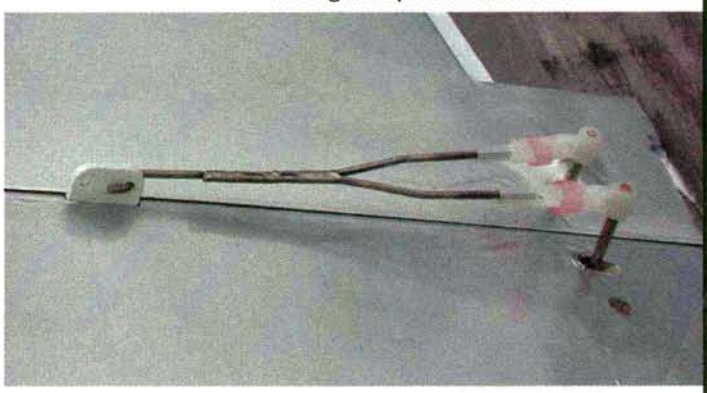
In its basic trainer configuration, the model is equipped with clear plastic anti-spin "droops" that help to maintain proper airflow over the wing during low-speed flight. And to prevent airspeed from climbing too much, the model has airbrakes attached to the landing gear, and its flaps are set in the down position. But that's only the model portion of the progressive training system. Also included with this ARF are an instructional DVD, the Cockpit Master flight sim and a TrainerLink buddy cord to connect the instructor's and student's radios! Here's a breakdown of what you get:

>The Mustang is a well-thought-out sport design, and with the PTS version, this ARF is even easier to assemble! The fuselage and wings are built of wood using nicely laser-cut parts, and everything comes securely packed in the box. The parts fit for all the subassemblies is nice and tight. The tail surfaces are solid sheet construction, and everything is covered with UltraCote. Even the decals come already applied. The canopy is glued into place, and the engine cowl has already been installed and cut to fit around the engine. The model comes with the Evolution engine, throttle linkage and fuel system installed and factory-adjusted. Even the muffler is installed—complete with a pressure tap connected to the vent line. The radio system (a JR XF421EX) is included, and the servos, the receiver, the battery pack and the switch harness all come completely installed as well. All the pushrods and control linkages are installed for you. All the control surfaces are hinged and ready to go, and the aileron servos and control linkages

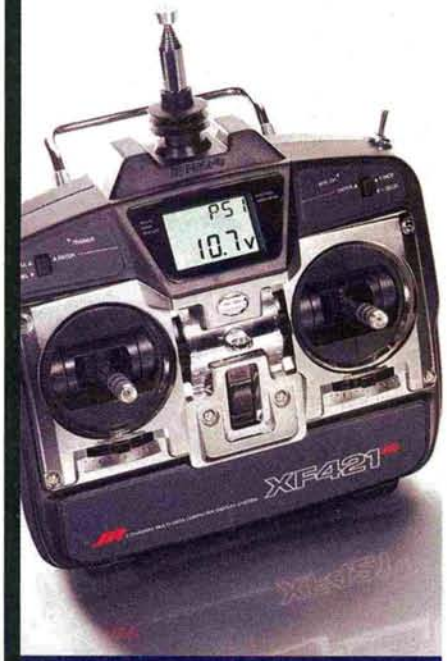
These clear plastic anti-droops attached to the wing's leading edge turn the Mustang into a pony ride! Set up in the Trainer mode, the model has amazing slow-speed characteristics.



The aileron servos come installed under flush-fitting hatches. Even the control linkage comes installed.



This Y-shaped control linkage is used to position the flaps up or down. You can install a servo later to make the flaps functional.



RADIO SPECIFICATIONS

RADIO: JR XF421EX (included)
TYPE: 5-channel FM (aircraft) with 2-model memory
BAND: 72MHz
RECEIVER: R610
TRANSMITTER BATTERY TYPE: 9.6V, 600mAh
OUTPUT STRENGTH: approx. 1 watt

FEATURES

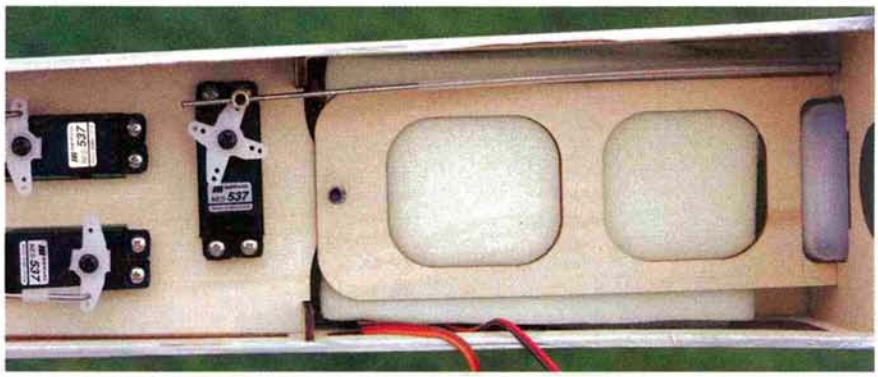
- Trainer switch
- 4 NES-537 servos
- LCD display
- Neck-strap eyelet
- Carrying handle
- Auxiliary landing-gear switch
- Standard switch harness
- Input key
- Adjustable control-stick lengths
- Wall charger

PROGRAM FEATURES

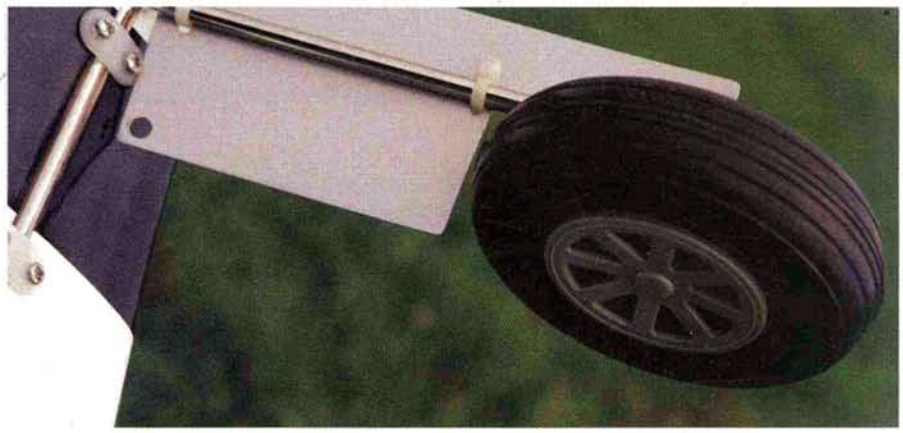
Model reset, model select, wing-type mixing, V-tail mixing, model name, servo-reversing, subtrim, travel adjust, servo-reversing on all channels, subtrim on all channels

COMMENTS

The included buddy-box trainer system is compatible with all current JR transmitters. It can also be used with Futaba transmitters.



Out of the box, there's nothing to do with the radio gear except charge the battery pack; everything comes installed.



These speed brakes prevent airspeed from building up. When you've gained some experience, you can remove them for improved performance.

Two screws in the bottom of the fuselage hold the tail surfaces in place.

are in place. There's nothing to do but slide the wing tube into place, slip the two wing panels together and add a strap and two screws to hold them together.

The tail surfaces are also super-easy to install—no gluing! Two long, threaded rods come attached to the vertical fin, and these pass through the horizontal stabilizer and slip through the fuselage. Two locknuts secure the tail surfaces in place from underneath the fuselage. Install the main landing gear, attach the spinner and 3-blade prop, hook up the flap linkage, and you're done! Total assembly time is less than 15 minutes—honest!

>Instructions on a DVD and in an illustrated instruction guide help new modelers through each step of model assembly and show the proper setup of the control surfaces. The basic tools required to do the job are shown, and the DVD takes you from the building bench to the flying field in short order. But the most important thing to remember is to find an instructor to check your workmanship and to guide you through the learning process. The Mustang PTS comes with its own buddy-box trainer cord to connect the instructor's and student's radios. (A second radio for the instructor is required.)

With the flaps down and the anti-droops in place, the Mustang PTS is a great basic trainer; it just doesn't look like one!

>Evolution engine One of the hurdles that always gets in the way of newcomers to the hobby is the model's engine. This is because you usually have to break it in before you can fly with it. The Evolution PTS (Power Training System) engine that comes with the package has been broken in at the factory, and its needle valve is adjusted for a good idle and reliable performance. A limiter pin is installed in the needle-valve assembly, so you can't adjust the setting too rich or too lean; in fact, for this review, I only had to tweak the needle about four clicks for a perfect engine setting. The engine also comes with a spinner, a 3-blade training prop and a glow plug—all ready to go!

>The radio that comes with the Mustang PTS is a JR XF421, 5-channel computer radio (see "Radio specifications" sidebar), and this is a great addition to the total package! It works hand in hand with the student, so when he improves his piloting skills, the radio can be used to adjust the model's performance accordingly. When the time is right, the control throws can be dialed up to be increased for improved model response.

STUDENT'S LOG—STEP BY STEP

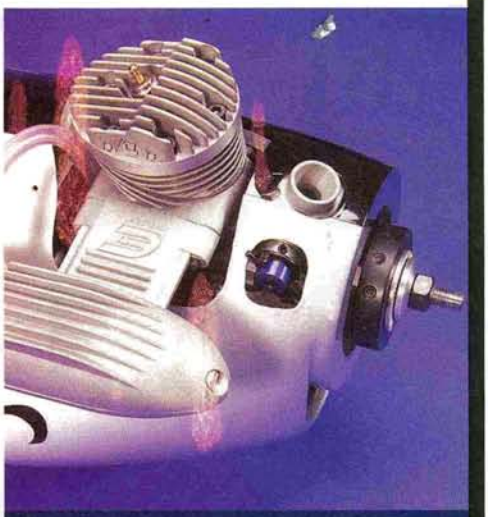
So, here we are with a completely assembled Mustang and an instructor pilot standing by. What can you expect? Well, for the first few flights, the instructor will take off and fly the model to a safe altitude, and then he'll turn over control to the student—just as pilots of full-size aircraft do. If the student gets into a jam, all the instructor has to do is release the trainer switch on his transmitter, and he will regain control of the model. After the flight lesson, the instructor takes control and lands the plane safe and sound!

After each flight, there's a short debriefing so the student and instructor can discuss the flight in detail. As the student's skills improve, the instructor will eventually tell him to take off and fly the model himself. But the trainer switch will still be manned and ready, just in case.

At some point, the student will gain the proper skill set and will be able to take off, fly around, set up for the landing and actually bring the model back down to the ground! He will have earned his wings by completing a solo flight. From here, however, it is the Mustang that will change to help develop the new pilot's skills.

The next step is to remove the speed brakes from the landing gear. This allows the model to achieve slightly faster airspeeds by lowering drag. The model will fly faster and will perform more smoothly. Once the pilot feels comfortable with this configuration, the next thing to do is to raise the flaps to the up position. With this setup, the model will be able to fly even faster, but it will also stall at a higher speed. Landings will have to be made a little faster, and the Mustang will start to fly more like a true sport plane.

The last step is the removal of the clear plastic anti-spin droops from the wing's leading edges to turn the model into a full-out, high-end performer. The droops are held in place with tape, and it takes only seconds to get rid of them.



>ENGINE SPECIFICATIONS

ENGINE: Evolution PTS (Power Training System, included)
TYPE: 2-stroke
DISPLACEMENT: .455ci
CYLINDER TYPE: ABC
BORE: 0.867 in.
STROKE: 0.770 in.
ENGINE WEIGHT: 16.32 oz.
CRANKSHAFT THREADS: 1/4x28
BENCHMARK PROP: 10x4 2-blade
RPM RANGE: 2,000 to 16,000rpm
FUEL: 10 to 30 percent nitro
PRICE: $79.99

COMMENTS

Ideal for those who are just getting started in the hobby and for instructors of new pilots, the Evolution PTS (Power Trainer System) is very beginner-friendly; it is the stock engine used in every Hangar 9 trainer. The engine is designed to get beginners into the air fast. The Evolution system is a combination of propeller and engine technology that's easy to start and run smoothly.

FEATURES

- >Canted glow plug tilts glow driver away from propeller
- >Ball-bearing-supported crankshaft
- >Needle-valve limiter pins guarantee easy starting and reliable performance
- >Remotely mounted needle valve for safe, easy adjustments
- >Flywheel system for easy starting and smooth idle
- >3-blade training prop for spirited performance and easily managed airspeed
- >No tuning, running, or break-in needed

IN THE AIR

The Hangar 9 Mustang PTS equipped with anti-spin droops and drag brakes has a pleasantly slow airspeed. With all the trainer add-ons removed, it turns into a great Sunday flying sport model. The forward-positioned landing gear makes taxiing a snap; the Evolution PTS engine never misses a beat!

CONTROL THROWS

The radio does not have dual-rate switches. Control throws can be adjusted by using its display screen and input keys.

Elevator: ½ in. up & down; expo: 0

Aileron: 5/16 in. up & 3/8 in. down; expo: 0

Rudder: ± 7/8 in. left & right; expo: 0

FLIGHT CHARACTERISTICS

Stability—trainer: set up in the trainer configuration, the model is very stable. Flown at reduced power, there is a lot of thinking time for a student pilot to figure out what's happening and make corrections.

Stability—sport: unwrapped, the Mustang PTS is stable enough to be a good, first, low-wing sport plane for someone who has already soloed. Stability is well balanced with maneuverability.

Aerobatics—trainer: flying into the wind, the model can be looped without much effort and requires full power. Rolls, however, are somewhat limited (a good thing for a trainer!) because aileron efficiency is lowered by the anti-spin droops.

Aerobatics—sport: in the sport-flyer mode, the model is a dream to fly. Aerobatics are crisp and predictable. Loops are effortless, while rolls can be almost axial if you are good enough on rudder and elevator inputs. Vertical performance is respectable. Extended inverted flight is also well within the model's flight envelope.

Glide performance—trainer: with the power pulled back to idle, the model almost stops forward flight and begins to descend. A fair amount of nose-down trim keeps the airspeed up to keep the controls responsive.

Glide performance—sport: the model is fairly lightly loaded for a .45-powered warbird, and with the flaps up, the glide is somewhat flat but fast. With flaps down, you need to add power to maintain the proper airspeed.

Stalls—trainer: at one point, I was flying the model with ¼ throttle and full up-elevator stick. The model did not stall going into a mild headwind. Landings are a piece of cake.

Stalls—sport: even in the unrestricted mode, the Mustang PTS has a mild, uneventful stall.

PILOT DEBRIEFING

Trainer: used in this mode, the Mustang PTS has a very wide flight envelope and is designed to be used for basic flight education all the way up to and including advanced flight techniques. The model can be trimmed for slow flight, and if it is flown on a calm day, the student will have most of the stick time! The transition from basic to more advance flight performance is very quick and easy. No additional equipment is required.

Sport: flown in the all-out sport-warbird mode with functional flaps, the model simply rocks. You can try all sorts of aggressive maneuvers and aerobatics with confidence. With the functional flaps hooked up, you can enjoy slow flight when you want to and shorten the landing approach for short-field operations. The Mustang PTS offers the best of both worlds.

GEAR USED

RADIO: JR XF421EX transmitter, JR 610 receiver, 4 NES 537 servos (all included)

ENGINE: Evolution PTS (included)

PROP: 3-blade PTS trainer (included)

FUEL: Wildcat 15% nitro

Now the model is totally unrestricted and has full aerobatic performance. Loops, rolls, snap rolls—you name it. The Mustang will be able to dish out a full plate of sport flying maneuvers.

BUT WAIT—THERE'S MORE!

As a bonus, the Mustang PTS is set up for the addition of another servo (sold separately) to raise and lower the flaps during flight. This gives the pilot the ability to land more slowly and take off a bit more quickly. After takeoff, the flaps can be raised for normal flight. You end up with a 5-channel, fun-scale warbird. What could be better than that?

The Mustang PTS is a very clever twist on the "basic-trainer" concept. Gone is the slow and boxy trainer airplane. No more must you bench-run the engine before it will run reliably, and you don't have to buy new models to further develop your piloting skills. Armed with the Mustang PTS, you can go from basic ground school and progress in measured steps to become a proficient and properly trained Sunday fighter pilot. All you need are an instructor and the desire to be successful. All the tools are here in one complete package, so what are you waiting for? ✚

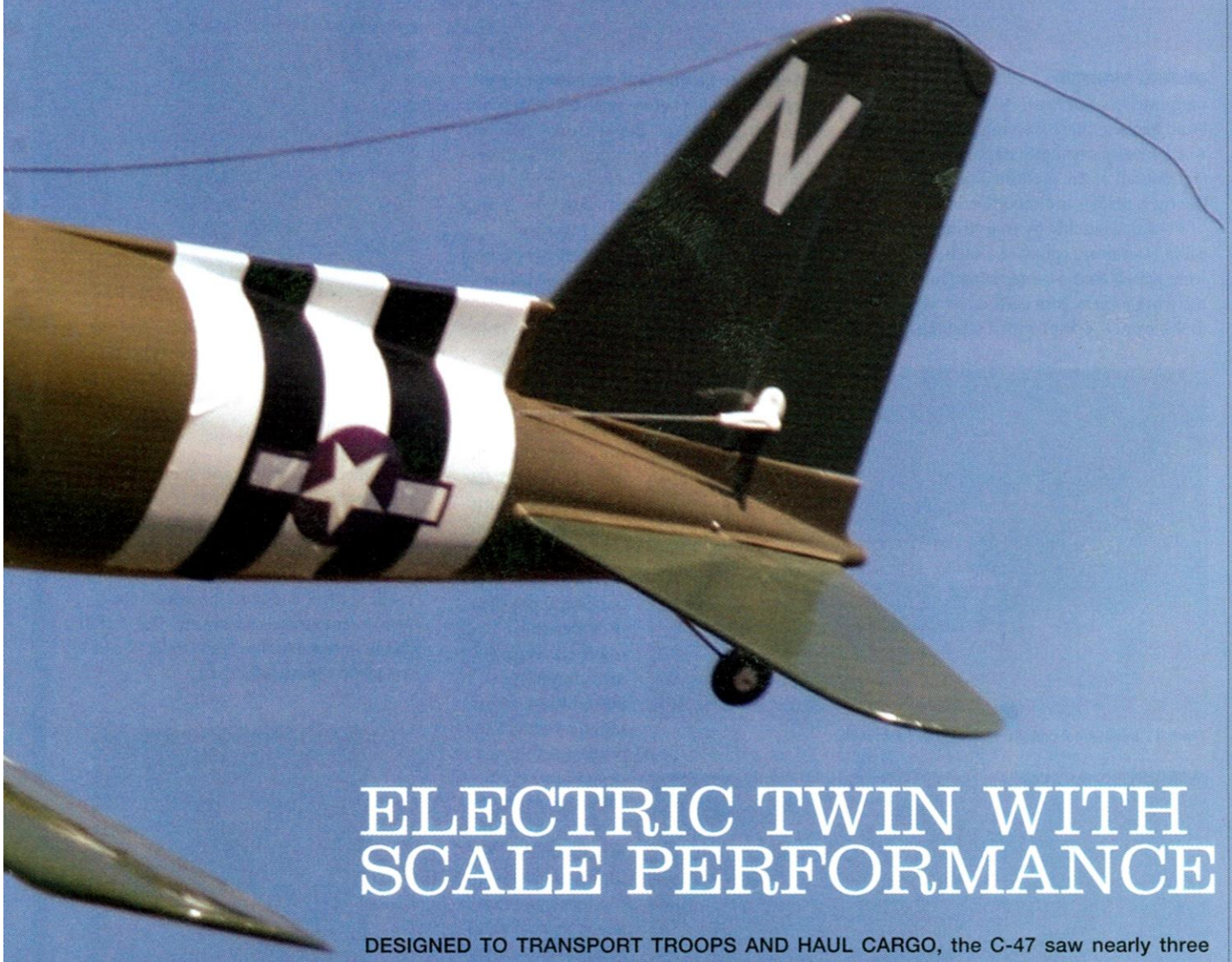
See the Source Guide on page xxx for manufacturers' contact information.

POLK'S HOBBY

C-47

BY JOE WELSH > PHOTOS BY JOHN REID & JOE WELSH

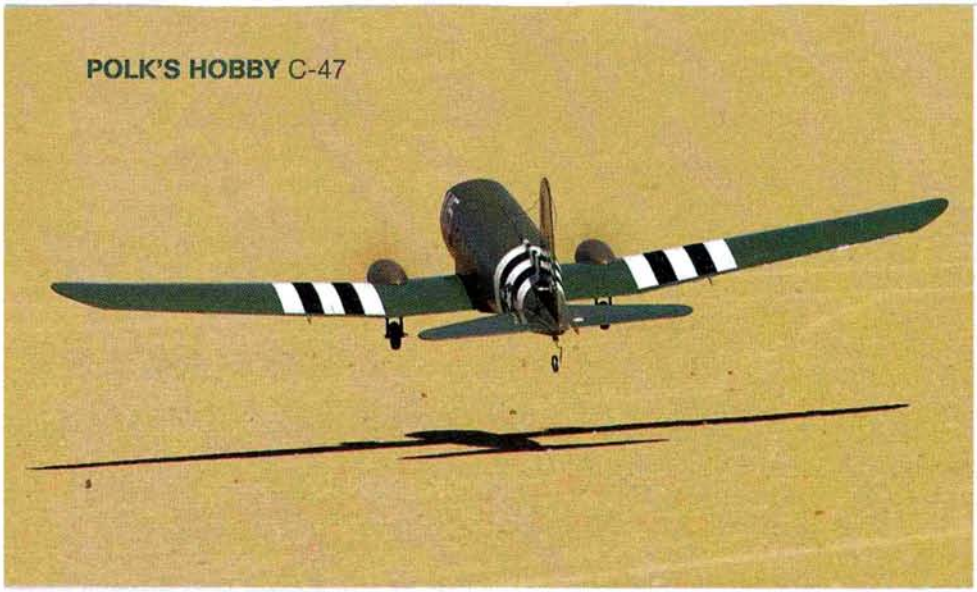
> "The C-47 is quite stable and EASY TO FLY."



ELECTRIC TWIN WITH SCALE PERFORMANCE

DESIGNED TO TRANSPORT TROOPS AND HAUL CARGO, the C-47 saw nearly three decades of service in the U.S. military. But even though it was widely used for so long, there aren't many scale models of the "Gooney Bird," so when I heard about the 72-inch-span Polk's Hobby ARF, I couldn't resist the idea of a large, electric twin.

This semi-scale C-47 features a blow-molded ABS fuselage, built-up tail feathers and a three-section wing covered with Solarfilm. All of the servo extensions and motor wires come installed, and the pushrods, servo tray and battery compartment are mounted in place. Two Speed 600 motors, nacelles, propellers and adapters and spring-loaded landing gear (to cushion hurried landings) are included. You'll need a 4-channel radio, 2 standard and 2 microservos, a 50A speed control and a 7-cell, 1400 to 2000mAh battery pack.



SPECIFICATIONS

MODEL: C-47
MANUFACTURER: Polk's Hobby
TYPE: electric twin
WINGSPAN: 72 in.
WING AREA: 472.7 sq. in.
LENGTH: 48.8 in.
WEIGHT: 6 lb., as tested
WING LOADING: 29.9 oz./sq. ft.
RADIO REQ'D: 4-channel w/2 standard servos and 2 microservos
MOTORS INCLUDED: 2 Speed 600
BATTERY REQ'D: 7-cell, 1400 to 2000mAh pack
PRICE: $125

COMMENTS

This semi-scale C-47 features an ABS fuselage, built-up tail feathers and a three-piece wing. It's easy to assemble and looks great in the air. It has nice, scale flight performance.

HIGHLIGHTS

- Scale flight performance
- Easy to assemble
- Motors included

GETTING STARTED

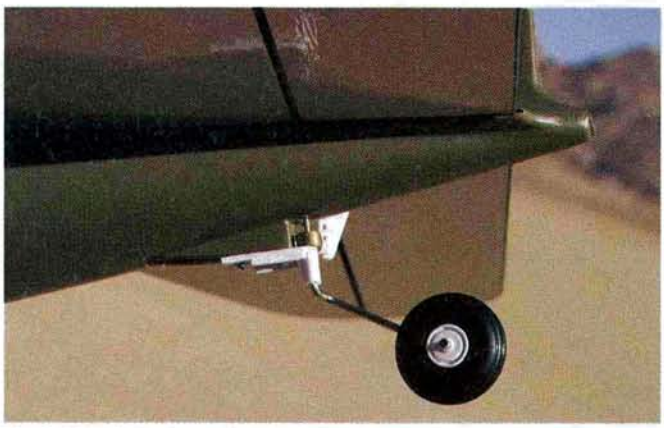
Large models like the C-47 are often easy to build because there is so much room to work. I was particularly impressed by the fact that all of the predrilled holes were in the right places—no modifications required.

I began assembly by trial-fitting and then using 30-minute epoxy to attach the outer wing panels to the center wing panel with the wing joiners. Join each outer wing panel to the center section with a separate batch of epoxy to be sure that the epoxy doesn't begin to harden before you've finished.

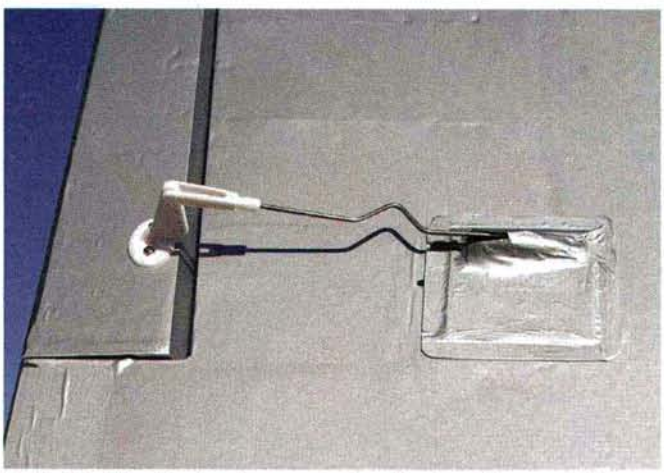
Next, I installed the aileron servos and pushrods. The included hardware allows limited control-surface adjustment, but because the aileron pushrods were longer than necessary, I was able put some V-bends in them so that I can now adjust the ailerons without using sub-trim on the radio.

All of the C-47's control surfaces come hinged with the plane's covering material. A quick check revealed that my rudder did not have enough deflection, so I cut it off with a hobby knife and reattached it with a strip of clear packing tape. This provides the required control movement. Next, I bolted the horizontal and vertical stabilizers into place (no glue needed). When you slide the horizontal stabilizer into place, lift the top of its cutout in the fuselage over the wooden blocks that are glued to the stabilizer. My plane's tail feathers came out straight without requiring any modification.

Standard servos fit in the servo tray perfectly, and the pushrods are already in the fuselage and ready to be connected to the control surfaces. I stood back and admired the airplane that was taking shape on my workbench.



The C-47's tailwheel can pivot, but it isn't steerable.



I added the V-bend to the aileron pushrod, so I don't need to use sub-trim on my radio.

POWER & CONTROL

I installed my receiver and speed control as far away from each other as is practical to avoid radio interference and used Velcro® to hold them in place. I cut a 1-inch-long slit in the side of the fuselage just in front of the speed control and bent it outwards so it would catch some cooling air. The switch is barely noticeable if you mount it in one of the plane's black windows.

Two standard servos easily fit on the factory-installed rails.

IN THE AIR

I knew that a large twin-engine plane such as the C-47 would look great cruising low over the runway. I was pleasantly surprised that the two Speed 600 motors provided more than enough power for a plane of this size and weight (98 ounces!).

CONTROL THROWS

Aileron: ± 1/3 in.
Elevator: +1/5, -1 in.
Rudder: ± 3/4 in.

GENERAL FLIGHT CHARACTERISTICS

> **Stability:** the C-47's large polyhedral wing doesn't have any trouble supporting it in the air.
> **Tracking:** this plane doesn't have any bad tendencies.
> **Aerobatics:** just like its full-size big brother, this C-47 was not intended for aerobatics.
> **Glide performance:** the plane's size makes landings especially enjoyable because good control is maintained even at slow approach speeds.
> **Stalls:** too much elevator, and it will stall with a drop of the right wingtip. A quick power-up and a drop of the nose, and it's flying again.

PILOT DEBRIEFING

With the twin Speed 600 motors, the C-47 actually has more than enough power for brisk climbouts. It's nice to have a little margin for error, and you can always get a more scale look by powering back slightly on takeoff for a more labored roll and a gentler climb angle.

The C-47 has a pivoting tailwheel that is not steerable. Your rudder will give you some control during the takeoff roll, but first, the plane's airspeed needs to increase. You won't have any problems if you put the plane on the centerline for takeoff and make sure that the tailwheel is pointing straight back.

Having the correct CG is important for the stability of any plane. I found that my C-47 would not balance properly without a slightly heavier battery than that recommended in the manual. If you use a lighter battery, you can always add lead, but it makes more sense to use a heavier, higher-capacity battery that will lengthen your flight times (I had 6-minute flights with my setup). I used CP2400SCR cells because they can handle the high current draw from the two motors.

I was impressed by the C-47's scale flight performance. It will take a little work to make my takeoffs look more labored, like those of the full-scale plane, and to slow my pitch and bank changes for that great scale appearance, but I look forward to practicing!

GEAR USED

RADIO: Futaba 9C w/2 S3001 servos and 2 S3108 microservos

DRIVE SYSTEM: 2 Speed 600 motors (included); ElectriFly C-55 ESC

PROPS: 8-inch diameter (included)

BATTERY: 7-cell Sanyo CP2400SCR, 2400mAh pack

The motor mounts and main landing gear are bolted right onto the wing. Before mounting the motors, you can break the brushes in by connecting the motors to 4, D batteries (6 volts) while they're suspended in a cup of distilled water. Adjust the water level in the cup so that only the brushes are covered. Let the motor run for 20 to 30 minutes, and you will notice that the brushes have conformed nicely to the commutator's shape. It is normal for the water to turn dark brown or black. (Don't use your flight battery and speed control to break your motors in; you could damage the speed control.) I then bolted the motors to the mounts—a perfect fit.

The C-47's wing is bolted to the fuselage, so you can remove it for transportation. The battery area in the nose accommodates a standard, sub-C, flat, 7-cell pack. I installed the pack and attached the wing for a ground test. As soon as I heard the great hum that only a twin can make, I couldn't wait to go flying!

THE VERDICT

I was impressed that all of the pieces fit perfectly, and the drilled holes lined up on my first attempt. The C-47 is also durable enough to survive small bumps and bruises better than most balsa models. I also like that it's equipped with spring-loaded landing gear for hurried landings.

A little rudder finesse is required to take off from a narrow runway, but once in the air, the C-47 is quite stable and easy to fly. It is designed for scale flight, and it serves its purpose well. Just wait until you see your first takeoff and landing!

See the Source Guide on page xxx for manufacturers' contact information.

"This bird is fully capable of engaging in THE MOST EXHILARATING flight stunts"

BY JOHN STEWART > PHOTOS BY JOHN REID

HOBBICO SUKHOI SU-31 ARF

.60-SIZE RUSSIAN SENSATION!

WITH ITS 9-CYLINDER, 400HP VEDENEYEV M14 GEARED radial engine and composite fuselage, the Russian-manufactured Sukhoi Su-31 has thrilled audiences worldwide with its exhilarating performances. The Su-31's power-to-weight ratio gives it the highest performance rating of any piston-engine aircraft made today, yet it is remarkably agile and responsive. This combination of power and maneuverability has enabled pilots from at least six countries to fly the Sukhoi Su-31 to successive world and European championships in both men's and women's categories. Hobbico's all-new Sukhoi SU-31 ARF captures the spirit of its full-size counterpart in a .60-size package. Equip this beautiful, all-balsa and plywood ARF with your favorite .50 to .91 engine, and you, too, can dazzle onlookers with your hometown version of the "Russian Rocket."

IN THE BOX

This high-performance ARF combines scale good looks with an ease of assembly that will get you from the workbench to the flightline in no time. The ARF kit includes professionally painted components such as a fiberglass cowl, wheel pants and canopy. The model is covered with iron-on material in an attractive multicolored trim scheme, and a dummy radial engine that fits perfectly in the fiberglass cowl is also included, as are aluminum main landing gear; 3-inch, extra-light main wheels; a 1-inch tailwheel assembly; a two-piece, nylon engine mount; a 12-ounce fuel tank; CA-style hinges; wooden servo trays; a complete hardware package; and a photo-illustrated instruction manual.

SPECIFICATIONS

MODEL: Sukhoi SU-31 ARF
MANUFACTURER: Hobbico
DISTRIBUTOR: Great Planes Model Dist.
TYPE: sport-scale aerobat
WINGSPAN: 61 in.
WING AREA: 708 sq. in.
LENGTH: 51.5 in.
WEIGHT: 7.85 lb.
WING LOADING: 25.5 oz./sq. ft.
ENGINE REQ'D: .50 to .71 2-stroke or .70 to .91 4-stroke
RADIO REQ'D: 4-channel with 5 standard servos (rudder, elevator, throttle, 2 aileron)
PRICE: $189.99

COMMENTS

The Hobbico Sukhoi SU-31 ARF combines appearance, performance and ease of assembly in a package that's perfect for any intermediate pilot.

HIGHLIGHTS

- Expert construction
- Beautifully painted parts
- Smooth and stable at all speeds

ASSEMBLY

Wing The wing is constructed of halves that you glue together. The first step is to attach the ailerons with CA-style hinges. I like to break these in by bending them at the hinge line before I install them. That not only makes for a control surface that moves freely, but it also gives you a visible crease so you can ensure that the hinge is properly positioned before you glue it in. Make sure that you apply thin CA to both the top and bottom of the hinge.

The wooden servo trays accommodate the dual aileron servos precisely, and preinstalled pieces of string allow you to pull the servo wires through the wing. If you don't use a computer radio, you'll need a Y-harness and two 6-inch servo-extension wires. I opted to use separate aileron channels because they allow more control options such as aileron differential and flaperons. With the servos in position, install the provided control horns and linkages. The hardware package includes FasLinks to attach linkages, but I chose to go with extremely reliable Z-bends.

A two-piece hardwood wing joiner holds the wing halves together. Before you apply any glue, test-fit all the pieces to make sure that everything fits; then use 30-minute epoxy to make the bond. Make sure that you have plenty of paper towels and rubbing alcohol nearby so you can wipe off any excess epoxy, and use masking tape to hold the assembly together. The manual recommends that you check the wing dihedral on a flat surface before the epoxy has cured and then block the wingtips accordingly. My model didn't require any blocking; the dihedral was right on target.

After you've assembled the wing, use epoxy to glue on the wing-bolt mounting plate and the balsa belly pan. When you cut through the covering to expose the wood for gluing, be careful not to cut into the wood. That could greatly weaken the structural integrity of the airframe and result in an "unplanned landing."

Fuselage and tail feathers Using a sharp hobby knife, remove the material from all of the necessary slots in the fuselage, and temporarily attach the wing to the fuselage with the provided hardware. Test-fit the stab and fin for proper fit and alignment, and then mark where the covering material should be removed to allow gluing. As noted above, be careful when you cut through the covering with your sharp hobby knife.

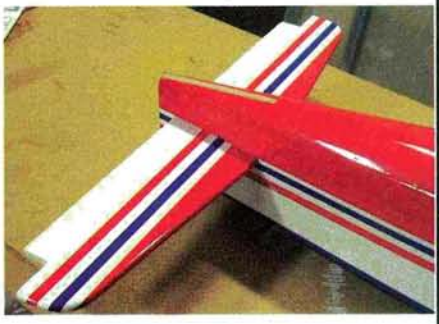
When I test-fit the SU-31's tail feathers, I was impressed with their accuracy and fit. All I had to do was apply the epoxy, let it cure and then install the control surfaces with CA-style hinges. Next, I assembled the main landing gear with the provided hardware and attached it to the fuselage with machine screws. Likewise, after you've built the wire tailwheel, secure it to the fuselage with sheet-metal screws.

Installing your favorite engine on the two-piece nylon engine mount is a straightforward process. Simply measure 5.25 inches from the front of your engine's thrust washer toward the back of the mount and then drill the holes. The mount (with engine attached) can then be accurately attached to the firewall by aligning the marks on the mount with the marks on the firewall. Don't worry about compensating for right thrust because Hobbico has included the correct amount in the engine firewall. How do I know? For one thing, it's visible; more important, though, is that the Sukhoi SU-31's first flight—and all subsequent ones—have occurred without a single click of trim adjustment on any control surface—not one! For me, that's a first.

There's plenty of room for the 12-ounce fuel tank. I wrapped it in a layer of ¼-inch-thick RC foam rubber and ran zip-ties through the bottom of the fuselage to secure it. The fuselage also provides lots of space to run your fuel lines, and I used a fuel dot to permit easy fueling at the field with the Sukhoi's fully cowled engine.

Before you attach the engine cowl, install your throttle servo and linkage. Next, glue the four wooden cowl-mounting blocks to the fuselage in the areas indicated, and fuelproof them with thinned epoxy or CA. Slide the cowl into position, center the thrust washer in the front opening of the cowl and

There is plenty of room inside the engine cowl for the stock muffler. I used a Du-Bro Silicon muffler extension to direct the exhaust gases through a hole in the cowl's bottom.



The tail feathers fit great. I used masking tape to hold everything in the proper position while the epoxy cured.

IN THE AIR

Turning an APC 13x8 propeller, the Saito .91 engine is ideal for Hobbico's Sukhoi SU-31. That combo provides plenty of power on the up line and to pull out of throttle-off, low-altitude maneuvers. Takeoffs are easy, and the plane slows down on command for easy landings.

CONTROL THROWS

Elevator: ± 5/8 in. (high); ± 1/2 in. (low); expo: 40%
Aileron: ± 3/4 in. (high); ± 1/2 in. (low); expo: 40%
Rudder: ± 1 1/2 in. (high); ± 1 in. (low); expo: 40%

GENERAL FLIGHT CHARACTERISTICS

>Stability: no surprises—smooth and stable on the ground and in the air.
>Tracking: the Sukhoi flew off the building board without one click of control-surface trim. Tracking has been utterly predictable from the first flight.
>Aerobatics: of course—and with ease!
>Glide performance: the plane slows down well for landings and seems to have adequate glide performance for a scale aerobatic plane.
>Stalls: are gentle and easily recoverable.

PILOT DEBRIEFING

The Sukhoi Su-31 has long been a favorite at full-scale airshows, and considering how easily this plane went together, I was curious to see whether its performance would match the pleasure of building it, and it did.

Taxiing was simple, but as with all tail-draggers, you must hold a little up-elevator to prevent it from nosing over. Once airborne, the plane climbed out easily and flew wherever I pointed it. When it came time to wring it out a bit, it did not object. Knife-edge can be flown with minimal rudder and with very little aileron or elevator input. Stall turns are simple, and snap rolls are crisp.

The Hobbico Sukhoi SU-31 has been a blast to fly from the get-go, and I enjoy flying this plane every time I take it out. I've also noticed a real improvement in my flying skills!

obtain the forward and aft positions by measuring 5 3/8 inches from the firewall toward the front of the cowl. That may sound complicated, but it isn't; the instructions are accurate and result in a great fit. When you're happy with the cowl's position, tape it down thoroughly with masking tape, and drill your attachment holes. Drill the first hole, and install a sheet-metal screw and washer. Proceed to the next hole, but continue to inspect the fit.

When the cowl fits properly, cut all of the necessary holes after you've carefully marked them on the engine cowl, and take your time to achieve a professional-looking finish. I always make small marks and start with tiny holes; then I gradually increase them to their finished size. This method may take longer, but it pays off in your cowl's appearance. Because I used a Saito .91, I was able to keep the stock muffler completely inside the cowl. I used a Du-Bro Silicon exhaust extension to expel the exhaust gases through the cowl's bottom.

At first, I wasn't too excited about adding the dummy radial engine; it had to be trimmed and painted, and I was a little concerned that it might cause the engine to overheat—particularly with a fully cowled engine and muffler. After I installed it, though, I saw that it enhanced the ARF's looks, and I'm glad I took the extra time to attach it. I did add extra cooling slots to it; maintaining a ratio of 1 part cowl-intake air to 3 or 4 parts cowl-exhaust air provides excellent cooling and trouble-free engine performance.

>Radio installation The spacious fuselage easily houses the servos and radio gear. The manual recommends that you join the two control rods near the single elevator servo using wheel collars and thread-lock, but I opted for a more secure solution. Using a 1-inch-long piece of 3/16-inch-diameter brass tube, I simply spliced the two control rods together and soldered the connection.

With the Saito .91 on the nose, I still had to add 5 ounces to the front of the firewall to get the model to balance dead on the recommended center of gravity (CG) range. Keep this in mind when you position your battery pack and receiver. Despite this additional ballast, I was very pleased with my Sukhoi's overall weight: just 7.85 pounds.

FINAL TOUCHES

The next task is to cut out and attach the painted canopy. I used R/C-56 to achieve a strong, clear bond. All that was left to do was to set the control throws, laterally balance the model, double-check the CG and take a few minutes to go through the checklist at the end of the instruction manual.

ALL IN ALL

The Hobbico Sukhoi SU-31 is an excellent product that offers fine scale looks in a high-performance, fully aerobatic airframe. Don't let its smooth, stable and predictable handling characteristics fool you; if you can provide the input, this bird is fully capable of engaging in the most exhilarating flight stunts. For intermediate fliers who want to step up, the Hobbico Sukhoi SU-31 ARF is an excellent choice. +

See the Source Guide on page xxx for manufacturers' contact information.

GEAR USED

RADIO: Futaba 9CAP transmitter, Hitec RCD 3500 receiver, 4 Hitec HS-425BB servos (control surfaces), 1 Hitec HS-300 servo (throttle)

ENGINE: Saito .91 4-stroke

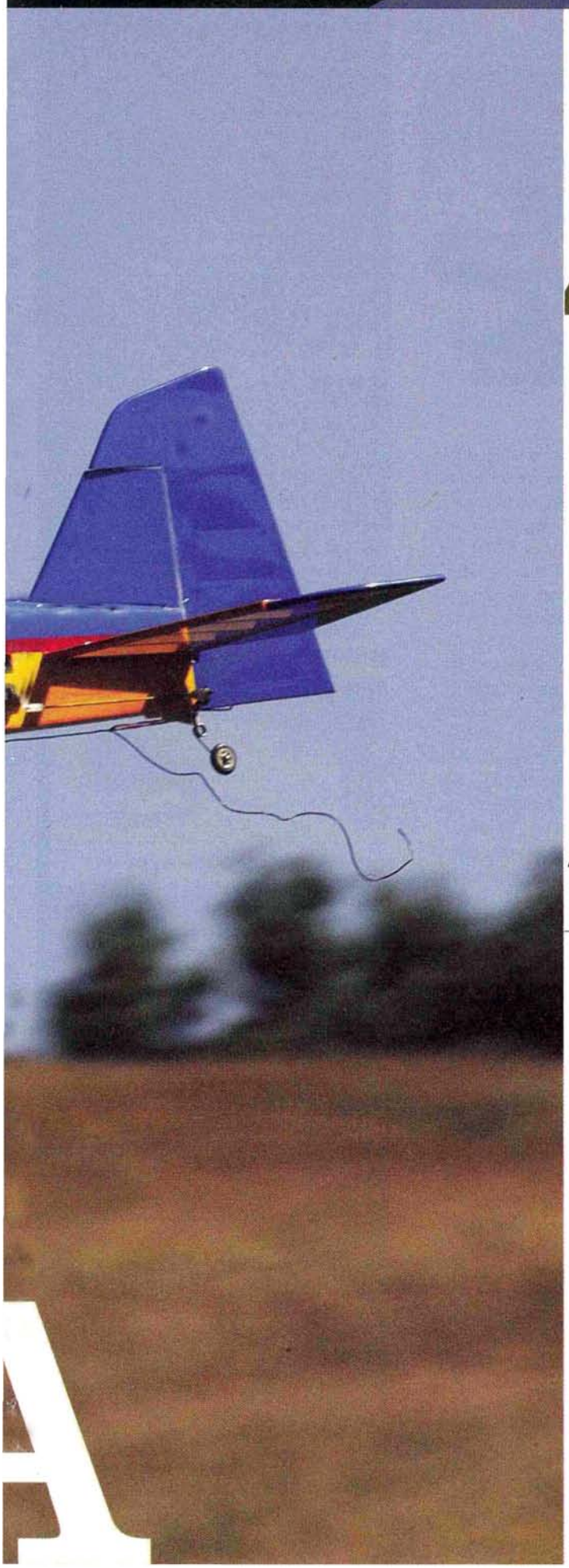
FUEL: Powermaster 15%

PROP: APC 13x8

NORTHEAST SAILPLANE PRODUCTS

SAMBA

BY RODNEY ROY > PHOTOS BY PETE HALL



"... the Samba's aerobatic prowess is hard to beat ..."

A HOT ELECTRIC SKY DANCER

Northeast Sailplane Products is known for great-looking and, more important, excellent flying planes, and the Samba upholds these standards. This almost-ready-to-fly (ARF) plane is very easy to assemble, and when your flying buddies see it fly, you'll be fighting them for a turn on the sticks!

THE KIT

The Samba can be assembled very quickly, thanks to its built and covered one-piece wing, fuselage and tail feathers. All of the parts are built of lightweight balsa and lite-ply and are covered with transparent yellow and solid blue iron-on film. For strength, the fuselage fore and aft turtle decks are made of hollowed foam that's sheeted with balsa. The kit also includes pushrods, control horns, formed-wire landing gear, light foam wheels, a clear canopy and well-illustrated instructions.

SPECIFICATIONS

MODEL: Samba
MANUFACTURER: LN Model
DISTRIBUTOR: Northeast Sailplane Products
TYPE: electric sport ARF
WINGSPAN: 51 in.
WING AREA: 497 sq. in.
LENGTH: 44 in.
WEIGHT: 40 oz.
WING LOADING: 11.59 oz./sq. ft.
MOTOR REQ'D: brushless outrunner
RADIO REQ'D: 4-channel (aileron, elevator, rudder, throttle)
PRICE: $189.95

COMMENTS

The Samba is an impressive airplane with a wide performance envelope. Its size allows it to fly in conditions that would ground smaller models.

HIGHLIGHTS

- Finely crafted airframe
- Excellent covering job
- Spectacular performance

ASSEMBLY

The Samba requires very little building to get into the air. You need only align the wing with the fuselage, glue the tail feathers into place and install the radio gear and power system. I was able to complete the model during one weekend.

Wing assembly Like many ARF models, building starts with the one-piece wing. I first checked the wing for warps and noticed that it had about ¼ inch of washout, just as the manual says it should have. The hole for the wing's alignment/hold-down dowel in the leading edge is drilled at the factory; I had only to glue it into place. I glued the plywood mounting plate into the fuselage and attached the wing, making sure that it was centered and that the wingtips were an equal distance from the rear of the fuselage. I then drilled a pilot hole through the wing and into the plate. I enlarged the hole in the plate and installed the blind nut for the wing bolt. When installing the blind nut, make sure that the flange is toward the canopy. I next glued the wing-bolt reinforcement plate to the bottom of the wing after I had removed the covering to ensure a good glue bond.

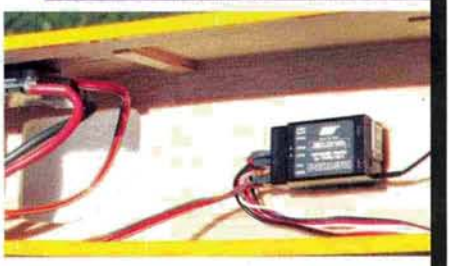
Installing the aileron servos is easy and takes only a couple of minutes. I removed the covering from the servo cavities, mounted my Hitec HS-85BB servos and hinged the ailerons with clear hinge tape. The aileron-servo leads reach the wing's center section, but you'll need to add a Y-harness or two short lead extensions to reach the receiver. The kit includes brass couplers that you must solder to the pushrods for the clevises. For a cleaner, easier installation, I used threaded 2-56 rods and Great Planes nylon clevises and snap keepers. I used the same parts for the elevator and rudder linkages.

Fuselage The instructions recommend that you hinge the stabilizer/elevators and vertical fin/rudder and then glue them to the fuselage before you add the power system. I decided to reverse the assembly sequence and install the power and radio systems before adding the tail feathers to minimize the chance of damaging them during assembly.

NSP recommends several power systems for the Samba (depending on your performance requirements), and the company supplied an MP Jet AC28/20-7 MK 2 brushless outrunner motor, a Castle Creations Phoenix 45 ESC and a 5mm prop adapter. For power, I used a Thunder Power 3S2P 4200mAh Li-poly battery. This motor/battery combination offers excellent performance at a reasonable cost. I mounted the motor on the rear of the firewall with short, 3mm bolts. From there, I stuck the ESC to the side of the fuselage with Velcro® and attached the JR 610M micro-receiver to the underside of the cockpit floor. I coated these areas with a thin layer of epoxy so that the tape's adhesive would have a smooth surface to stick to.

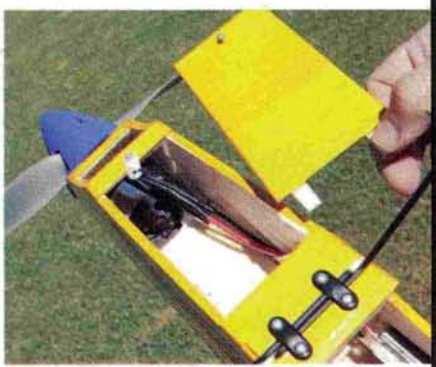
At the rear of the fuselage, there are four bays for the elevator and rudder servos. I removed the covering from all four and installed the servos as indicated in the instructions. The other two openings serve nicely as cooling air exits. Before attaching the stab, extend the stabilizer slot to the rear of the fuselage; I used a razor saw to cut the wood.

I hinged the elevator to the stab with hinge tape and centered the assembly in the fuselage stabilizer slot. I marked and removed the covering from the center section of the stab and then glued it into place with 30-minute epoxy. Here's where I ran into two minor problems. The elevator joiner is a stout piece of spruce, and when the elevators are moved through their range of motion, the joiner hits the rear of the fuselage and limits the elevator's movement. At

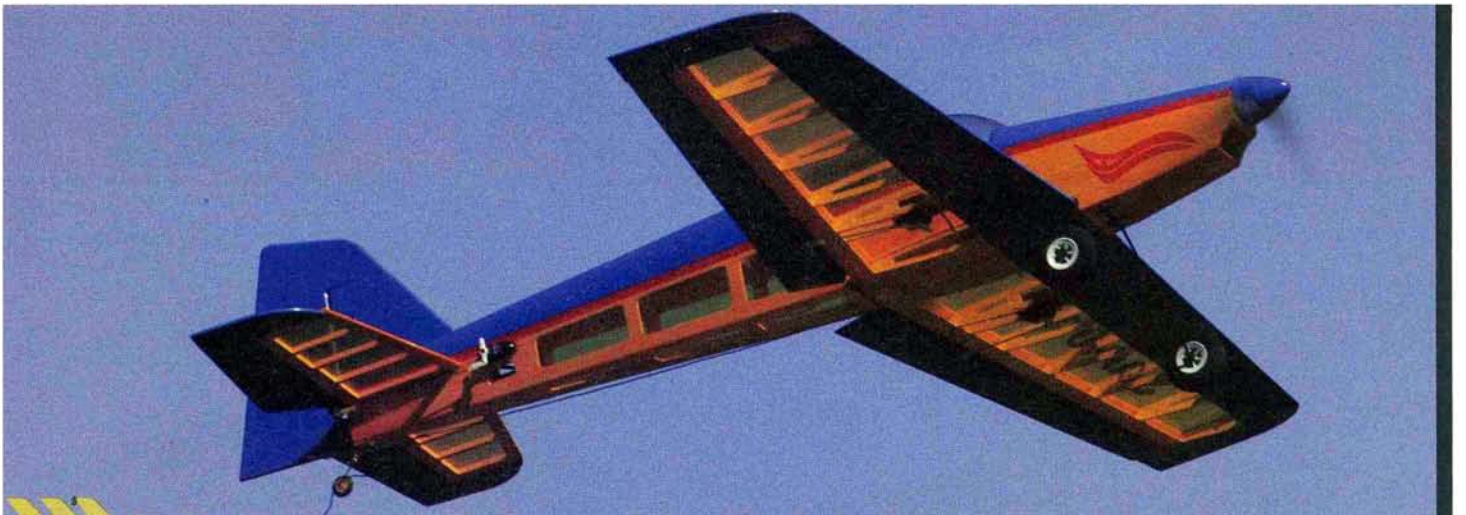


The fuselage holds the receiver and the ESC.

The elevator and rudder servos are installed in the rear of the fuselage. Note the air-exit cooling hole.



Access to the battery is via a convenient hatch.



IN THE AIR

With an all-up weight of 40 ounces, I knew the Samba would be an amazing performer, and I wasn't disappointed! With a fully charged 3S2P battery and an APC 11x7 prop, I plugged my AstroFlight Whattmeter into the system and recorded the following numbers at full throttle: watts, 304; amps, 29; volts, 10.2.

CONTROL THROWS

Aileron: ¾ in. (low); 1 in. (high); 20% expo
Elevator: ½ in. (low); 1¼ in. (high); 25% expo
Rudder: 1 ½ in. (low); 2¼ in. (high); 20% expo

GENERAL FLIGHT CHARACTERISTICS

- **Stability:** the Samba is an honest airplane that goes where you point it.
- **Tracking:** given its lightness and low wing loading, the Samba tracks very well. It flies through wind gusts as if they weren't there.
- **Aerobatics:** "wow" says it all. The Samba is incredibly agile, and you can change its heading in an instant. The model doesn't have any bad tendencies.
- **Glide:** thanks to its thin airfoil, the Samba glides effortlessly.
- **Stalls:** when pushed really hard, the Samba will stall very gently; the built-in washout plays a key role here.

PILOT DEBRIEFING

With 108 watts per pound, the Samba takes off in a big hurry; it doesn't matter whether it's on grass or a hard runway. The MP Jet outrunner is a powerful motor, and it pulls the Samba straight up with little effort. At full throttle, the Samba is very fast, and the controls are crisp. It is rock-steady and goes where you point it. The Samba also flies smoothly at slow speeds, so it's easy to land. When it's a foot or so off the runway, slightly increase up-elevator until it gently touches down for a polished 3-point landing.

The Samba's aerobatic capabilities are marvelous. The recommended throws are for conventional flying, and it does maneuvers such as loops, rolls, figure-8s, Cuban 8s and knife-edges very well and gracefully. I did feel, however, that the aileron throw could be increased slightly for quicker rolls.

Although it isn't advertised as a 3D performer, the Samba has 3D in its veins. With the CG moved aft and the control throws pumped up, it will harrier nose-up at 45 degrees with very little wing rocking. In a hover, it needs about ¾ throttle to maintain altitude; pulling out requires full throttle. Switching to a prop with a larger diameter and a lower pitch will make hover-type maneuvers easier to do.

the rear of the stabilizer slot, I made two 45-degree cuts for the joiner so that the end of the slot looks like a horizontal V and provided the clearance needed.

I also found that the elevator joiner prevented the vertical fin from seating fully on the fuselage; I had to make a cutout on the leading edge of the rudder. A couple of minutes with a sharp knife remedied this problem. The rudder is hinged only on one side, so I added the remaining hinge and then glued the assembly into the fuselage. Next, I taped the rudder and elevator into a neutral position, centered the servos and made and attached the pushrods. You'll need two 12-inch servo extensions for the servos.

FINAL DETAILS

I attached the factory-bent landing gear to the bottom of the fuselage and secured it with nylon straps and screws. I trimmed the canopy and attached it to the fuselage with a couple of strips of clear tape.

I fastened the wing to the fuselage and figured out where the battery should be to get the center of gravity (CG) at 3½ to 4 inches from the wing's leading edge. Because Li-poly batteries are so much lighter than comparable Ni-Cds or NiMHs, they have to be installed as far forward as possible; this put the CG at the 4-inch mark. I made a battery tray out of 3/32-inch lite-ply and glued it into the model's nose. I also placed a strip of Velcro® around the tray to hold the battery in place. To add that finishing touch, I added a 2-inch-diameter Du-Bro spinner. I then double-checked the Samba, and it was ready for its first flight.

CONCLUSION

The Northeast Sailplane Products Samba is a great-looking, easy flying and well-mannered plane that you'll be pleased to own. I really enjoyed assembling and flying this model, and the recommended brushless MP Jet outrunner motor makes the Samba my favorite grab-and-fly model. With its light wing loading, the Samba's aerobatic prowess is hard to beat, yet its stability makes it relaxing to fly. I look forward to flying the Samba for quite a while. ✚

See the Source Guide on page xxx for manufacturers' contact information.

GEAR USED

RADIO EQUIPMENT: JR XP8103 transmitter, JR 610M micro-receiver, 4 Hitec HS 85BB servos (2 aileron, 1 elevator, 1 rudder), Castle Creations Phoenix 45 ESC

MOTOR: MP Jet AC28/20-7 brushless outrunner

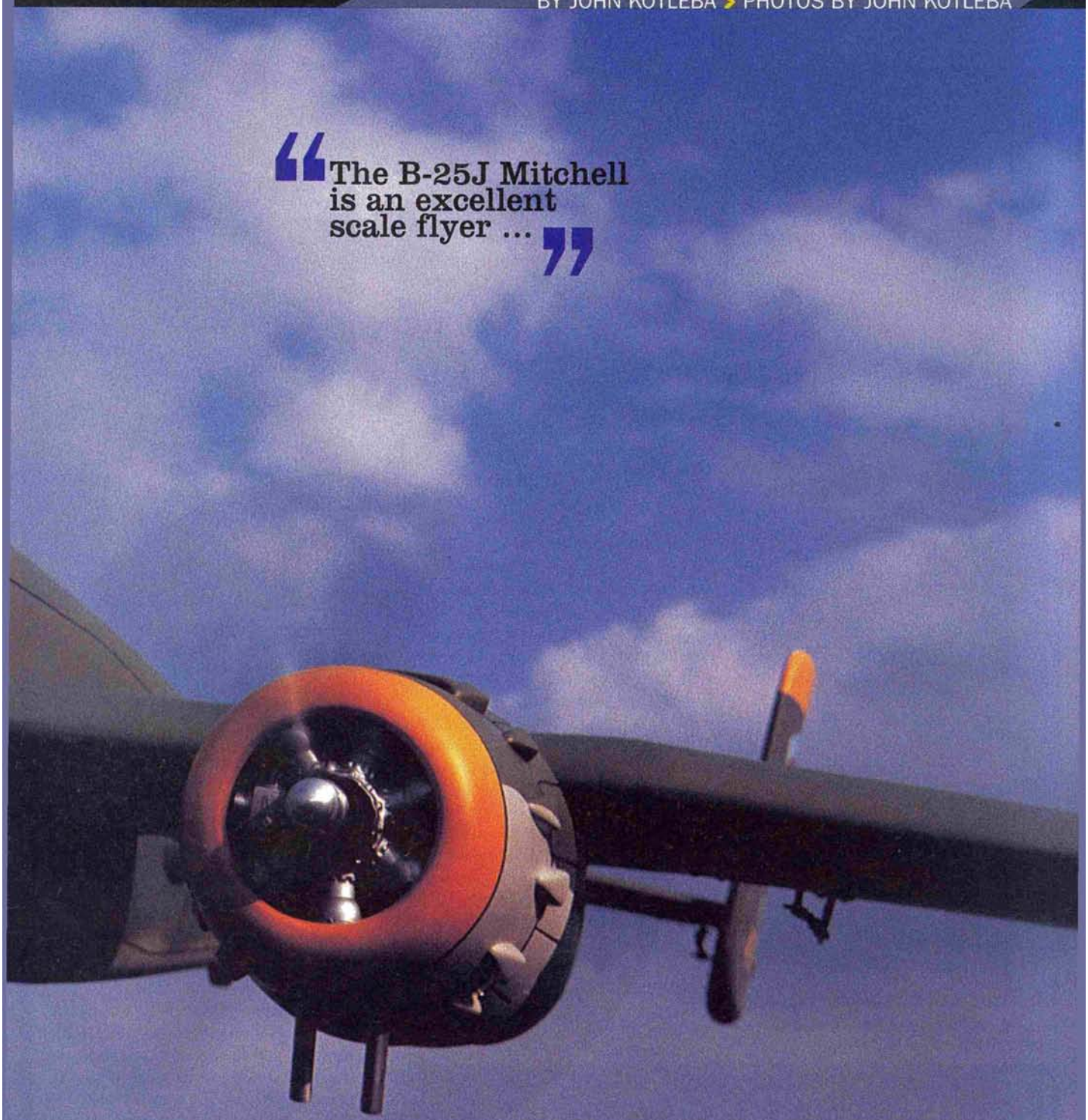
BATTERY: Thunder Power 3S2P 4200mAh Li-poly

PROP: APC 11x7 electric

KONDOR MODEL PRODUCTS

B-25J MITCHELL

BY JOHN KOTLEBA > PHOTOS BY JOHN KOTLEBA



> "The B-25J Mitchell is an excellent scale flyer ..."

TWIN-ENGINE THRILLS!

ON APRIL 21, 1992, A RESTORED B-25J MITCHELL BOMBER named "Heavenly Body" roared down the deck of the aircraft carrier *USS* Ranger in San Diego Bay in honor of the 50th anniversary of the Doolittle raid on Tokyo. Kondor Model Products has recently added an ARF replica of this stunning B-25 to its line of scale classics.

SPECIFICATIONS

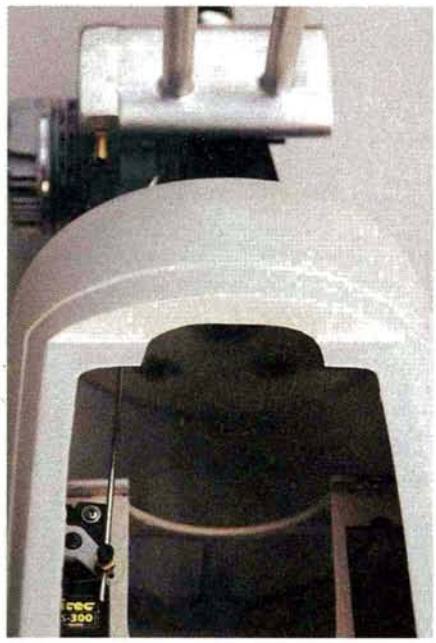
MODEL: B-25 Mitchell
MANUFACTURER: Kondor Model Products
WINGSPAN: 83 in.
LENGTH: 66.9 in.
WING AREA: 6.34 sq. ft.
WEIGHT: 16.5 lb.
WING LOADING: 41.6 oz./sq. ft.
ENGINES REQ'D: two .46 to .61 2-strokes or two .70 4-strokes
RADIO REQ'D: 6-channel w/13 servos (elevator, retracts, nose steering, 2 rudder, 2 throttle, 2 aileron, 4 flap)
PRICE: $589

COMMENTS

This B-25 receives a lot of attention at the flying field. It can be flown easily by any intermediate warbird pilot.

HIGHLIGHTS

- Great flight performance
- Complete air-retract system included
- Plenty of room for radio equipment

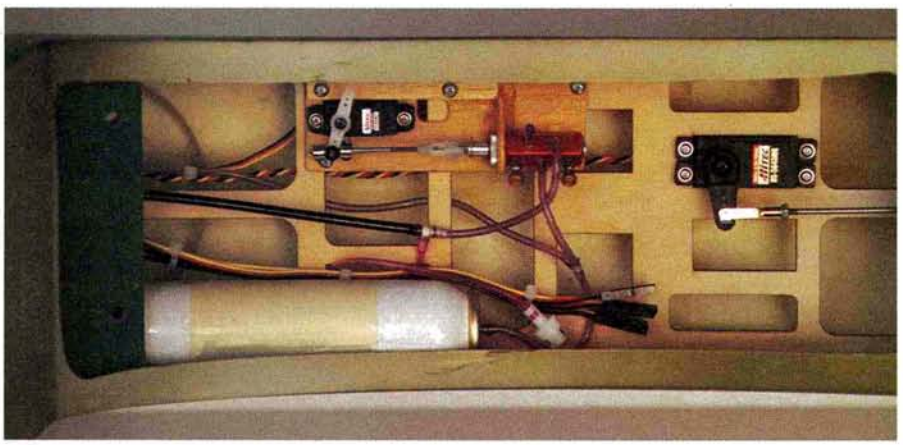


Each nacelle needed to be trimmed to allow room to install the assembled fuel tanks.

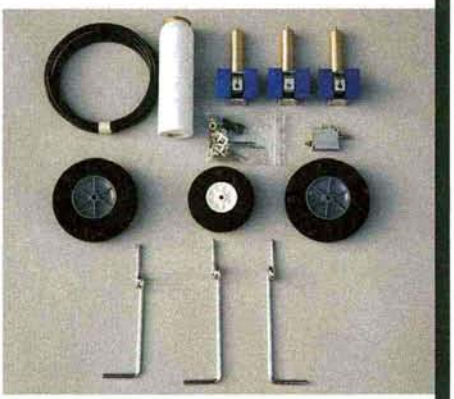
IN THE BOX

The plane arrived in two large boxes that separated the fuselage from the wings and tail feathers. On opening the boxes, my pulse raced with excitement as I examined the flat green and light gray surfaces that had panel lines molded into the fiberglass fuselage and engine cowls.

The kit contains all-wood wings and tail assemblies that come built and covered in a heat-shrink fabric film, and the fuselage, nacelles and cowls are made of fiberglass. It also arrives with a generous supply of hardware, linkages, pushrods, nylon engine mounts and fuel tanks. I was delighted to see a complete set of pneumatic retractable landing gear that includes an air tank, fill valve, connectors, air line and control valve. Robart Mfg. is making a set of scale custom gear for this B-25; it will cost about $390. Kondor also includes a step-by-step, photo-illustrated instruction manual and decal sheets.



The fuselage provides plenty of room to mount radio and retract equipment.

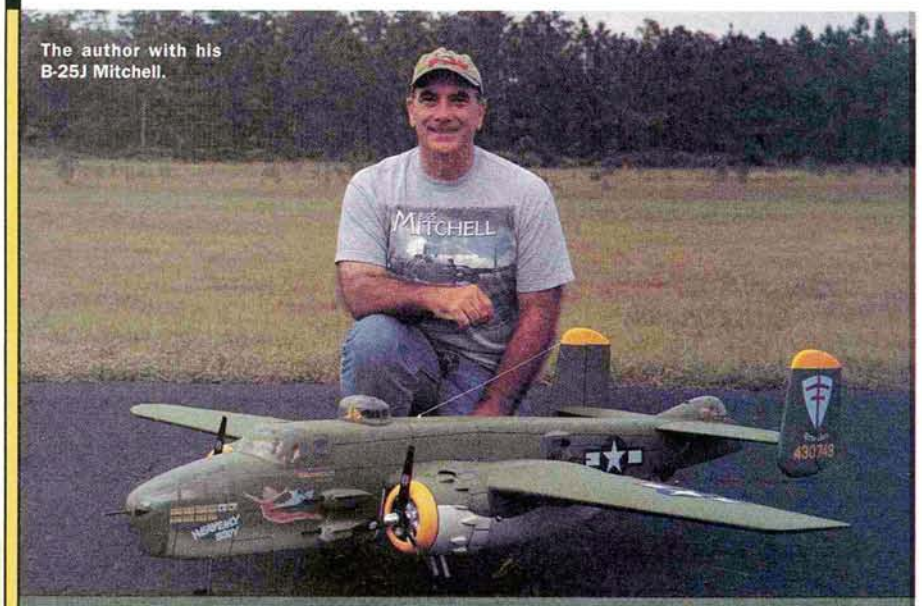


A complete air retract system is included.

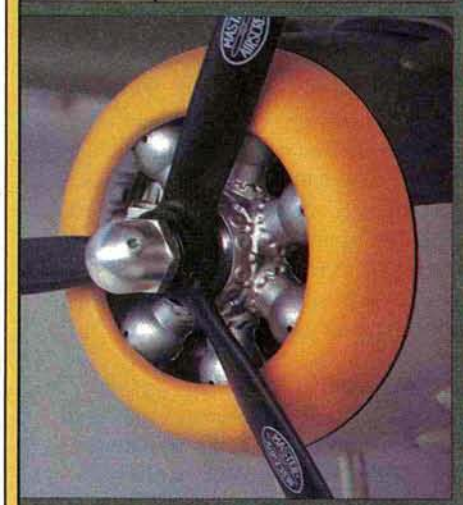
I first inventoried all of the parts in the box according to the accessory lists in each section of the manual. This was an opportune time to sort the hardware by size. I noted that the manual lists 2x35mm screws; that should read 2x30mm. Two of the canopies were cracked beyond use; I contacted the staff at Kondor, and they sent replacements. I was impressed by the condition of the fabric film that covered the wings and tail surfaces. They had very few wrinkles, and I easily removed them with a heat gun. If you do this, be careful not to warp the assemblies.

ASSEMBLY

Wings I attached the aileron and flap to each wing half and installed all their respective servos as illustrated in the manual. I



The author with his B-25J Mitchell.



DRESSING UP THE MITCHELL

I ALWAYS LIKE TO ADD AS MUCH DETAIL AS possible to my warbirds, and this B-25J Mitchell is no exception. I bought 1/10-scale WW II figures from Hangar 9 to use as pilots and gunners. I cut these latex figures to size and brought them to life with water-based acrylic paints. To cover the engine cowls' large front openings, I cut two Wing Mfg. 7-cylinder radial engine faces (item no. AC-903) to size. I removed the material between the cylinders to allow sufficient air to flow through the cowl for engine cooling. Last, it didn't seem right not to have a gun barrel sticking out of every opening, so I purchased a Wing Mfg. machine-gun package (PK1001-M), which consists of scale Browning .50-caliber machine guns that must be assembled and painted. Put realism into your B-25: the result is well worth the effort.

Top: side-turret machine gun installed and ready for action.

Center: the cylinder engine face adds realism to the engine cowl.

Bottom: machine-gun kit and assembled product.

used a servo for each flap section instead of incorporating one servo and relying on flexible pushrods to operate all four flap sections. To achieve perfect alignment and help pin together the wing halves, I inserted a small section of 1/4-inch dowel through holes near the trailing edge of each wing root rib. I used 30-minute epoxy to glue the dihedral brace and wing halves together.

Engine installation I decided to install two O.S. Max .50 SX 2-stroke engines. Since the centerlines were not marked on the firewall, I had to take some very accurate measurements. I side-mounted the engines to achieve the best operational reliability and then installed a pair of Pitts-style mufflers that fit nicely inside the cowls. After I drilled the engine mounting holes, I coated the back of the firewall with 30-minute epoxy thinned 50 percent with alcohol and allowed it to cure overnight before I inserted the 4mm blind nuts. That helps to prevent the blind nuts from being pulled through the wood when you tighten the engine mount.

Fuel tanks When I assembled the fuel tanks, I incorporated a third line to use as my fill line. Each nacelle had to be trimmed to allow room to install the assembled fuel tanks. Each fuel tank's neck protrudes through a center hole in the firewall and is mounted with a generous amount of silicone sealant between the tank and the firewall to help damp vibration from the engines. I then installed the pushrod and servo for each engine throttle, making sure that it would not interfere with the fuel tank.

Retracts Installation of the air-retract system is fairly simple for anyone who has experience with pneumatic retracts. I noticed that not only is the configuration of the nose retract different from the main gears, but the wire strut is also a different length. I like to secure each air-line connection with a small piece of wire looped twice around the air line and over the connector and carefully twisted to prevent air leaks (twist ties with the paper removed work well for this).

Fitting the cowls I trimmed the cowls to fit over the engines' cylinder heads and muffler exhaust stacks and drilled holes in them to access the carburetor needles. I cut out the PVC exhaust vents and glued them into place around the perimeter of the cowls. Because all of the PVC exhaust vents are

IN THE AIR

My good friend George Schmauch first flew the B-25 while I snapped some in-flight photos. Then I took over the controls to better evaluate the plane's flight performance. The grass runway at our flying field is cut short and is very well maintained.

CONTROL THROWS

Elevator: ± 3/8 in.; expo: 30%
Aileron: ± 3/8 in.; expo: 30%
Rudder: ± 4/5 in.; expo: 30%
Flaps: - 3/10 in. (low); - 4/5 in. (full)

GENERAL FLIGHT CHARACTERISTICS

Stability: the B-25 is very solid and smooth at low and high speeds, and the surface controls are responsive.
Tracking: the plane tracks straight and true down the grass runway and in the air with minimal rudder input.
Aerobatics: the B-25 performs axial rolls at a moderate roll rate, and its loops are round and fairly tight. I didn't attempt any other maneuvers.
Glide performance: because of its high wing loading, the B-25 will only "glide" at low throttle with full flaps, and that results in a smooth main-wheel landing.
Stalls: during induced stalls at engine idle, the B-25 would drop a wingtip, yet recovery is fairly quick as soon as you drop the nose and increase throttle.

PILOT DEBRIEFING

On takeoff, I give the plane as much airspeed as the runway allows before I apply a little up-elevator. The aircraft is very stable as it gains altitude (it required only two clicks of down-elevator to achieve proper trim). The center of gravity seems to be perfect when set at the location listed in the manual. I set it up for landing in usual warbird fashion—full flaps mixed with 5-percent down-elevator and reduce power to 1/3 throttle throughout the descent—and that produced a moderate sink rate. The B-25J Mitchell is an excellent scale flyer, and I recommend it for any warbird enthusiast.

green, I painted certain exhaust vents to match by mixing light gray and flat white enamel paint. I mounted the cowl formers to the firewall and assembled the cowls in place by gluing four pieces of hardwood blocks to each former and securing the cowls to the blocks using no. 4x3/8 sheet-metal screws. That is much easier than gluing the former to the cowl and trying to reach the screws that secure the former to the firewall through the front opening of the cowl, as depicted in the manual.

GEAR USED

RADIO: Futaba 9C transmitter and 138DP receiver; Hitec servos (7 HS-635MG —flaps, steering, throttles; 2 HS-625MG— ailerons; 2 HS-85—rudders; 1 HS-5645MG—elevator; 1 HS-81— retracts)

ENGINES: O.S. Max .50 SX 2-strokes w/Bisson Pitts-style mufflers

FUEL: Wildcat 80/20 blend

PROP: Zinger 11x8 2-blade

Fuselage Mount the main wing on the fuselage as shown in the manual; take your time to ensure a perfect wing-to-fuselage alignment. The fuselage provides plenty of room to mount radio and retract equipment. When I installed the nose retract, I made the tension in the steering pull-pull cables too taut, and that prevented the retract from locking in place when it was lowered for landings (go ahead; ask me how I know!). A small adjustment to the cables corrected this problem.

Tail assembly The tail assembly is pretty straightforward, as illustrated in the instructions. I used miniservos mounted in each vertical stab to control the rudders instead of one servo and flexible pushrods. My main concern was to ensure that all tail-surface areas were aligned with one another and with the main wing. I had to glue a thin strip of balsa to the right side saddle for the horizontal stab to keep it parallel with the main wing. When you cut the slots for the elevator pushrod, start with a very small opening and enlarge only as needed. Too large an opening will allow the pushrod to flex when actuated.

FINAL PREPARATIONS

After I trimmed the top turret and all of the canopies, I epoxied them into place instead of using screws. The canopies are very fragile, so take your time, and trim them with sharp scissors to avoid introducing cracks. I then flipped the plane over and used clear film covering left over from a previous project to seal all of the control-surface hinge-line gaps. After I applied all of the decals and highlighted the panel lines with an ink pen, I sealed all of these surfaces with a very thin layer of Top Flite LustreKote clear spray paint.

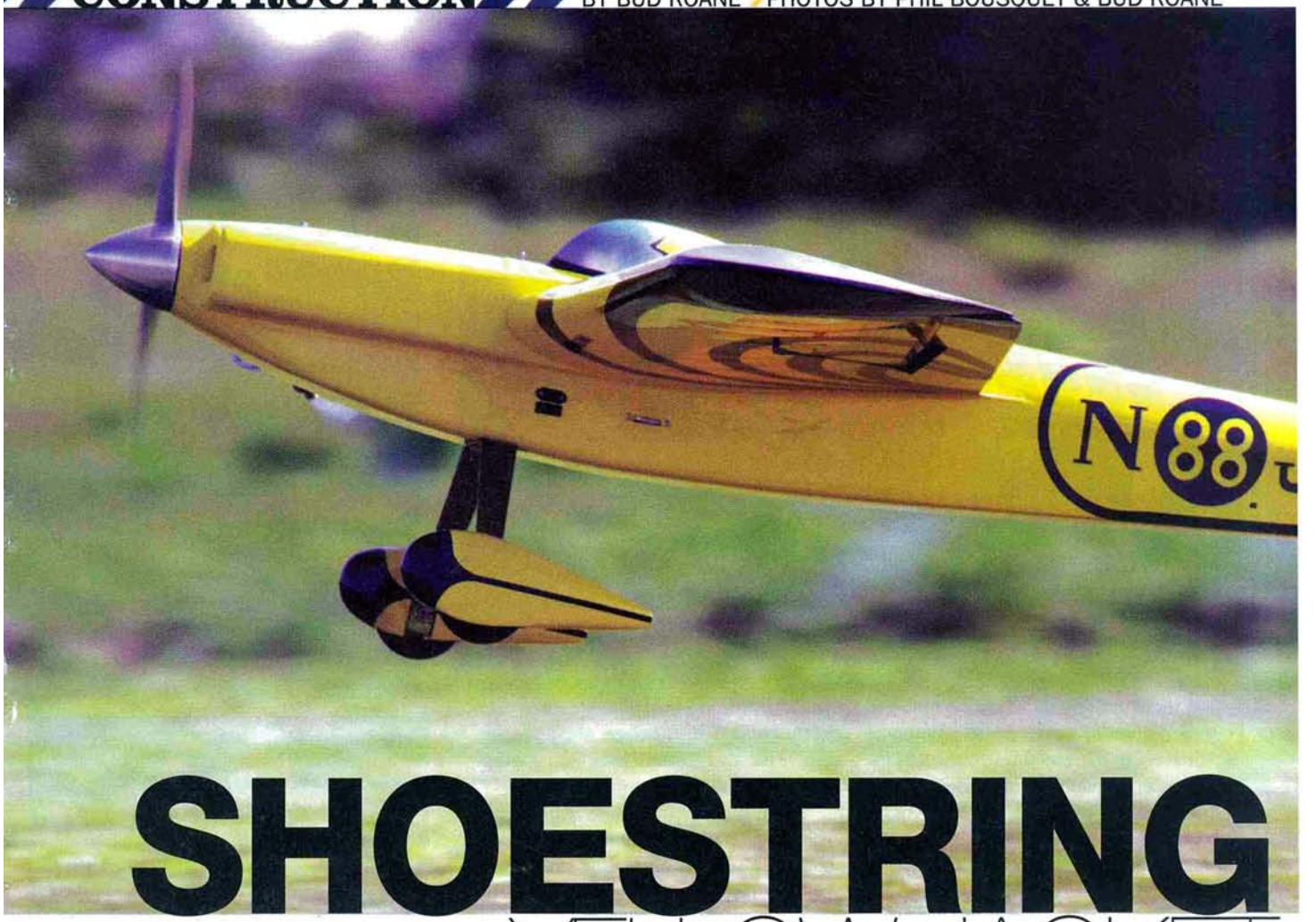
I balanced the model without adding any additional weight; I simply repositioned the receiver battery pack in the front nose section. I ran approximately five tanks of fuel through each engine on the bench. A dead engine on a twin can be extremely tricky for even the most seasoned pilot!

CONCLUSION

This plane should be assembled and flown by an intermediate or advanced warbird flier. This is a fantastic-looking ARF with very good flying characteristics. Take your time building this plane; I have approximately 70 hours of assembly time invested in it, and it really shows! I get lots of compliments on the plane's appearance and flight performance from fellow fliers at the field. Kudos to Kondor Model Products on producing such an outstanding model.

See the Source Guide on page xxx for manufacturers' contact information.

BY BUD ROANE › PHOTOS BY PHIL BOUSQUET & BUD ROANE

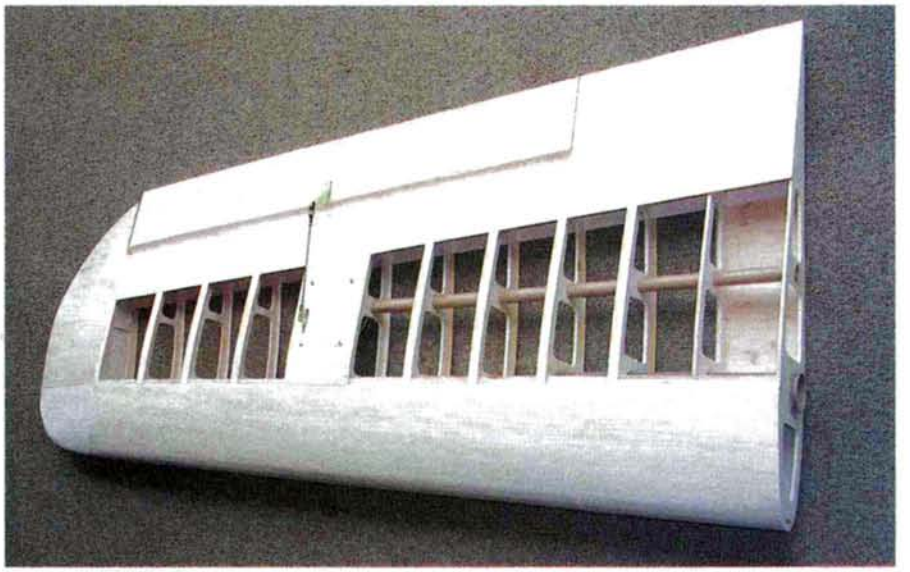


SHOESTRING YELLOW JACKET

A SPORT-SCALE, SUNDAY FLYER THAT LOOKS LIKE A PYLON RACER

The author with his Shoestring Yellow Jacket at the field. The sport flyer is of a good size and performs well with a Saito 1.50 engine.

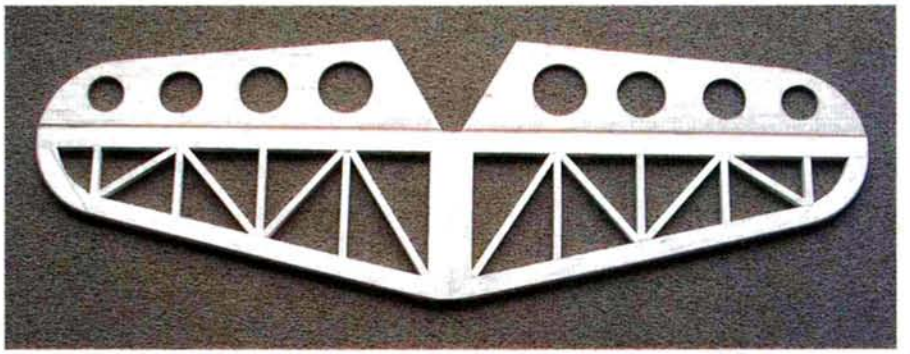
I WAS INSPIRED TO BUILD THIS RC MODEL by my old Carl Goldberg control-line Shoestring Stunter. It wasn't very scale, but it flew great, and I had a lot of fun with the ones I built over the years. The Shoestring was a Formula One midget racer designed by Rod Kriemendahl in 1949, and versions of it still race today. My version is IMAA-legal, has plug-in wing panels and is powered by a side-mounted Saito 1.50. The prototype flies fine with the dihedral wing, but my Yellow Jacket plans also show details for a zero-dihedral wing, so you can build either version.



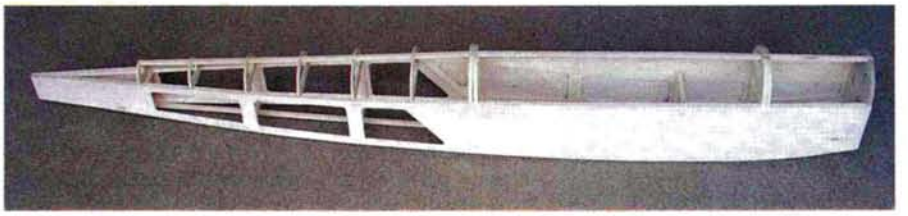
The completed wing panel with the aileron and servo hatch installed. The center-section sheeting will be added after the panel has been mated with the fuselage.

›WING PANELS Every rib has tabs on the bottom so the wing panels can be built on a flat surface. Cut partway through the tabs to make it easer to remove them when you finish the bottom of the panel. Pin down the bottom spar, and glue the ribs to it. Add the top spar and then attach the sub-leading edge, the trailing edge and the rear spar. After sanding the sub-leading edge and spar to match the rib's contour, attach the top leading- and trailing-edge sheeting. Now lightly tack-glue rib W1 into place so that you'll be able to adjust its angle when you fit the panel to the fuselage. Also leave the center sheeting off until later. Add the cap-stripping to all the ribs except W1 and W2.

When the glue has dried, remove the wing panel from the building board, and add the phenolic joiner tube and the cardboard servo-wire tube. To help position the lite-ply wing-root cap correctly, let the tubes protrude from rib W1 by ⅛ inch. Don't forget to add the ¼-inch birch plywood wing-bolt plate to rib W1.



The tail surfaces are very easy to build and are braced with external rigging wires. The plans show a beefed-up assembly.



Here, the fuselage structure has been assembled, and the top formers are in place.

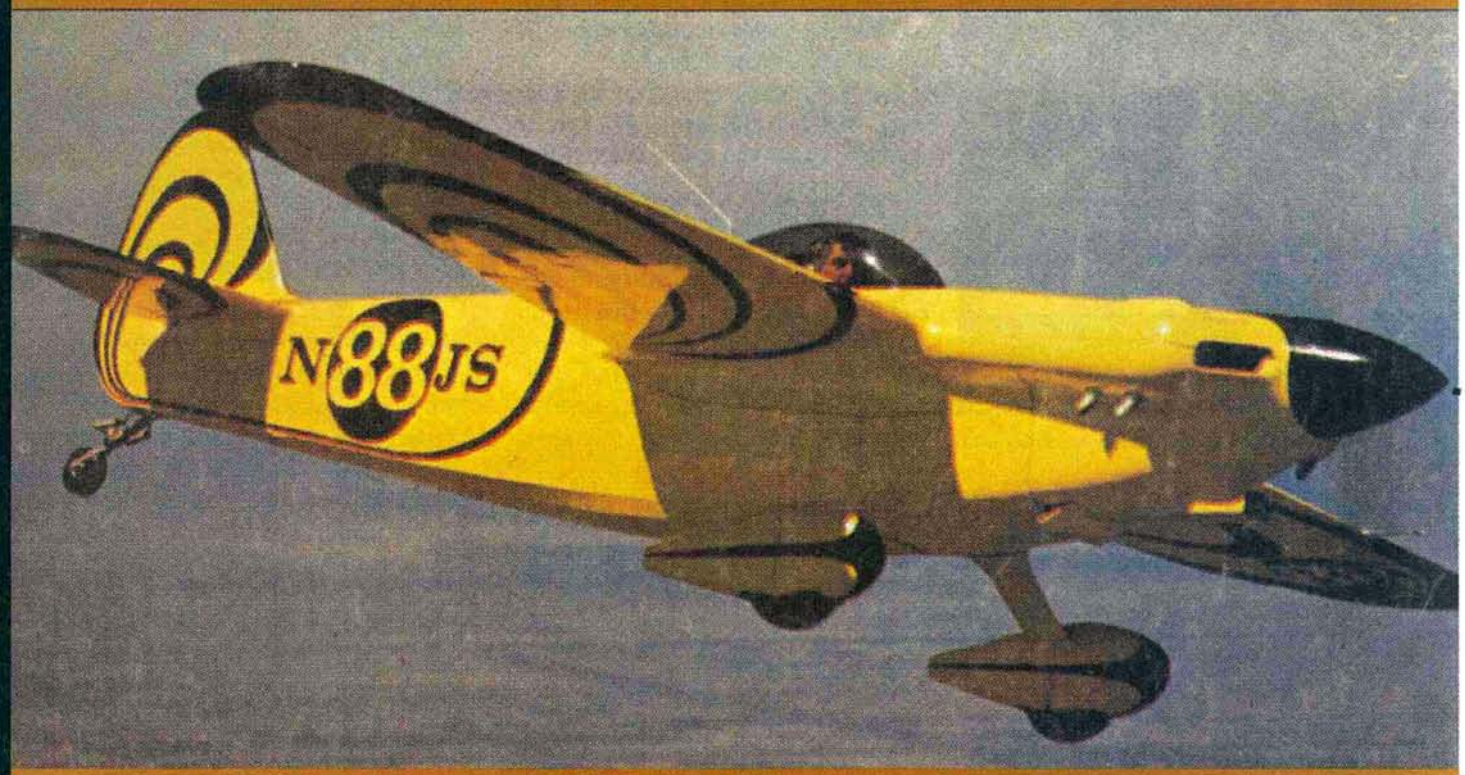
›SPECIFICATIONS

MODEL: Shoestring Yellow Jacket
TYPE: IMAA-legal sport flyer
WINGSPAN: 84⅝ in.
LENGTH: 68 in.
WEIGHT: 12 lb.
WING AREA: 1,300 sq. in.
WING LOADING: 9 oz./sq. ft.
ENGINE RANGE: 1.20 to 2.20ci 4-stroke; .90 to 1.40ci 2-stroke
RADIO REQ'D: 4-channel (rudder, throttle, elevator, ailerons)
RADIO USED: Airtronics RD6000 (with Airtronics, Hitec and JR servos)
PROP USED: APC 16x8
FUEL USED: PowerMaster 10%

This view of the wing bottom shows the main wing tube and the aileron-wire tubes installed. Notice the building tabs on the ribs.

Cut through the top sheeting behind the rear spar to make it easier to remove the aileron later on. Cut away the rib tabs, and sand the rib bottoms smooth. Bevel the bottom of the sub-leading edge and the rear spar. Tack-glue the rib tabs to the top sheeting (only at W1 and W12) so that you'll be able to pin the inverted panel flat on the building board. Add the bottom spars, and install the shear webbing. Glue the vertical webbing between the spars and the phenolic tube. Glue the bottom sheeting and the rib capstripping into place.

Cut the ailerons free of the wing panel by cutting through the ribs and the bottom sheeting with a razor saw. I made the



Yellow Jacket: son of Shoestring

TIME WAS, IF YOU WERE A PILOT FLYING IN FORMULA ONE (GOODYEAR) RACES AND YOUR NAME WASN'T RAY COTE or Bill Falck, you didn't race to win; you raced for third place because the other two always occupied the two top spots.

By 1950, the pattern was broken only occasionally: Bill Falck and his *Rivets* dominated races at lower altitudes, and Ray Cote (pronounced "Cotey") took the races held at higher-altitude airports because his airplane, *Shoestring*, had a higher aspect ratio. This enabled Cote to turn the pylons slightly tighter than Falck could in the thinner air.

Shoestring had the looks that said it just had to fly great. And that's what was on my mind as I prepared to fly *Yellow Jacket*, the first replica of *Shoestring* ever built. Jim Strode, the builder, kept telling me that it flew like a Cub, but I had a hard time believing that. If nothing else, just getting down into the cockpit dispelled the Cub comparison: I had to keep my legs absolutely straight and support myself with my arms while I slid my legs under the main spar. Is it tight? Yeah—like a wet suit. And then you feel like a prairie dog peeking out of its burrow, as wings, nose and canopy coaming all seem to come right up to your chin.

Yellow Jacket has a 100hp, 200ci Continental—the standard engine for Formula racers. It is also the engine that powers thousands of Cessna 150s. Somehow, I had the feeling *Yellow Jacket* wasn't going to fly like a 150.

I taxied out—wait, let me amend that: I started to taxi out, but I had to stop and remove my cowboy boots. I couldn't move the rudders without getting brake, so I had to fly it barefoot. When I brought the power up, the coarse-pitched prop was slow to get me moving, but that changed quickly as it accelerated. I let it fly itself off the ground at around 100mph and continued climbing at 110mph. And boy, does it ever climb! Even with that prop, it was going up at more than 2,000 feet per minute.

As I pushed the airplane into level flight, the speed quickly jumped to 175mph indicated (around 185mph true). Planting the throttle against the stop gave a solid 190mph indicated—well over 200mph at that altitude. How's that for 100hp? A racing prop would have added at least 15 more mph.

When you're rocketing around in a sweet-handling little speedster like this, it's impossible not to do something with it, so I looped and rolled until the dwindling fuel supply told me that it was time to go home. The airplane is so clean that it took a few high-G turns to burn off speed and get down under 90mph; then, the approach was really flat. Even at 85mph over the fence, it floated and floated ... and I was glad I had a long runway in front of me.

Although it has the neutral stability of a racer, it's difficult to imagine a sport airplane with more overall efficiency and fun packed into such a tiny bundle. *—Budd Davisson*

Visit Budd on the Web at airbum.com.

Here is the completed fin and rudder assembly with the lightening holes cut out.

rigging wires. The elevators and rudder should be tapered to an ⅛-inch-thick trailing edge. It's easier to taper the elevators and rudder with a plane before you cut out the lightening holes.

Start the fuselage by splicing the side pieces together, and then add the lite-ply doublers. Install the stringers and the bottom triangular corner stringers, and then taper them at the tail so that they will be ⅜ inch thick when joined. Glue formers F3, F4 and F5 to one of the sides, and then glue the other fuselage side into place to form a box structure. Pull and glue the rears of the sides together, and add filler as required where they meet at the tail. Pull the fronts of the fuselage

COMMENTS

Designed by Bud Roane, the Shoestring Yellow Jacket is a sport model that only looks like a speedy pylon racer. It is very aerobatic and makes a great Sunday flyer. It has traditional balsa and plywood construction and plug-in wing panels. The tail surfaces are flat for easy building.

Balsa blocks fill the area between the firewall and the spinner ring. The blocks are cut to shape, fitted around the engine and then sanded smooth.

control horns out of 3/32-inch-thick G-10 epoxy board from Frank Tiano Enterprises. Cap the aileron opening with ¼-inch balsa, and then glue the wingtip plate to rib W12. Assemble the wingtip former, and then add the tip sheeting and the leading edge. Round the leading edge, and sand the wing panel smooth. Install the control horn, and finish building the aileron. Now build the other wing panel.

›TAIL SURFACES AND FUSELAGE Build the tail surfaces (stab, fin, elevators and rudder) out of ⅜-inch-thick balsa. Be sure to use hard balsa for the trailing edges. The fin and stabilizer are braced with 1/16-inch sides together, and epoxy the firewall into place. Ensure that everything is straight and then glue in the rear fuselage cross-pieces. Add the rear-deck formers and the top and bottom stringers. Epoxy the landing-gear mount into place, and reinforce it with triangular stock. Sheet the fuselage bottom and the top deck with 3/32-inch balsa. Add the forward sheeting and then tack-glue the ⅜-inch stabilizer and fin spacer blocks into place. Add the tail filler blocks, and sand them smooth.

Install the engine with 2 degrees of right thrust and 2 degrees of downthrust. I used a C.B. Tatone mount and a plywood spacer that I sanded to give the correct right thrust and downthrust. Tack-glue the cowl ring to the back of the spinner, and then attach it to the engine. Fill in the area between the ring and the firewall with ½-inch balsa. Remove the spinner, the engine and the engine mount, then add the remaining filler blocks and sand them smooth.

›CHEEK COWLS The right cheek cowl extends only to the firewall and leaves room for the engine. Glue the formers to the cheek-cowl sides, add the top and bottom pieces, and pull them together at the trailing edge. Add the front pieces, and sand the cheek cowl to shape. The front cap piece should have an ⅛-inch-radius leading edge. Don't sand the side pieces until after you've attached the cheek cowls to the fuselage.

Install the phenolic wing-joiner tube in the fuselage, and glue the wing-incidence dowels into place. Slide the aluminum joiner tube into place, slide the wing panels up against the fuselage, and tack-glue the cheek cowls into position. Set the fuselage level, and use an incidence meter to check that both wing panels and the stabilizer are set at zero. When everything is properly aligned, permanently glue the cheek cowls into place.

Fit the wing panels against the fuselage with the W1 ribs flush with the cheek-cowl sides, and glue the ribs into place. Glue the rest of the center-section sheeting to the wing panels, remove the wing panels, and then add the lite-ply rib caps to the W1 ribs. Reinstall the wing panels and double-check their alignment. Protect the panels with masking tape, and finish sanding the cheek cowls. Remove the tape, and sand the wing panels and cheek cowls flush. Add the curved fillet to the cheek cowls' trailing edges, then glue the cockpit hatch sides into place.

The cockpit hatch is made out of four

With construction completed, you can see how easy the model is to build. Just add the covering of your choice, and you're ready to fly.

formers and balsa stringers, and it's sheeted with 3/32-inch balsa. Check for a good hatch-opening fit, add the outer formers and the side pieces, and glue on the top sheeting.

COVERING AND FINISHING The Yellow Jacket version of the Shoestring is about the most difficult color scheme there is. I covered the model with UltraCote yellow and added the black trim. I used plywood patterns to cut out the trim and ironed each piece onto the plane. I made the wheel pants out of balsa so that I'd be able to cover them with the same material as I used on the rest of the model.

FINAL ASSEMBLY

Make the landing gear out of 3/16-inch-thick 6061 T6 aluminum sheet. When you bend it to shape, leave a slight radius at the bends so that it doesn't crack. I installed a 16-ounce fuel tank, and it provides more than 12 minutes of flying time. I used 1/4-scale servos for the ailerons and rudder and a standard ball-bearing servo for each elevator. I used a servo of standard size for throttle. I connected the rudder with pull-pull cables, and the elevators use fiberglass pushrods.

The balance point shown on the plans may look as if it will cause the plane to be nose-heavy, but it's OK because the cheek cowls provide significant lift.

FLYING THE YELLOW JACKET

My model weighs 12 pounds and easily accelerates vertically from a stop. During takeoffs, the model comes off the ground in about 20 feet with a perky Saito 1.50 burning 10-percent-nitro fuel and turning a 16x8 APC prop. High-speed flight is comfortable, and I fly at about 1/2 throttle most of the time. During touchdown, the model slows to a walking pace without dropping a wing.

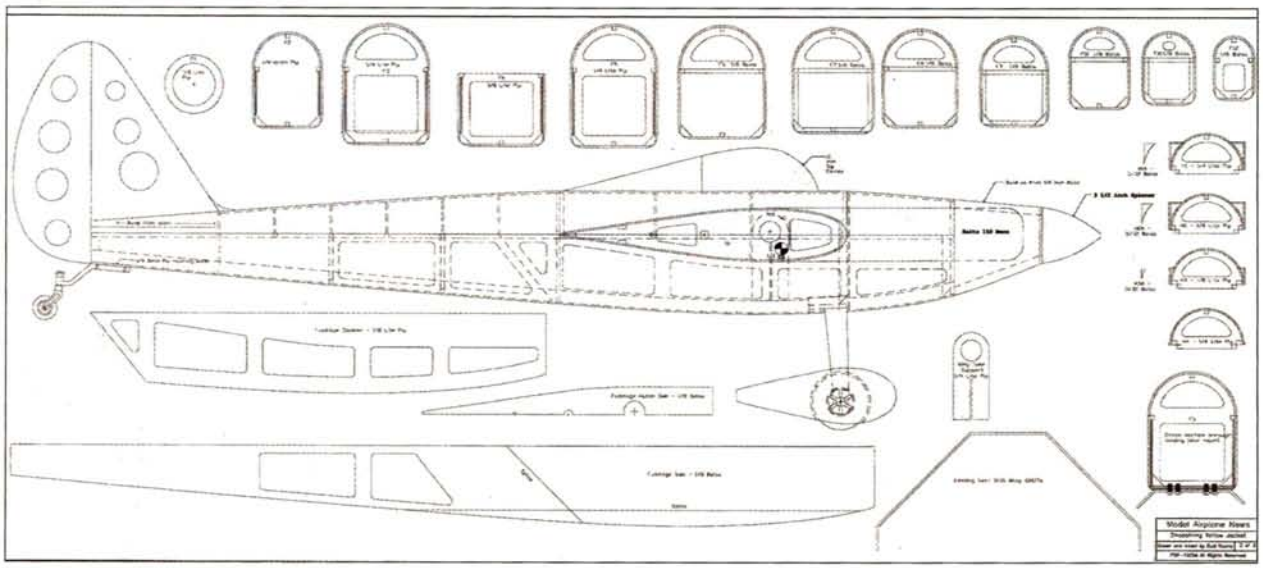
The model tracks well doing aerobatics. It didn't require aileron-trim adjustment. With the prototype's dihedral wing, there is a slight roll-coupling during knife-edge flight, and a slight aileron correction is required. I currently have the model balanced a little tail-heavy, and this seems to reduce the condition.

I have landed tailwheel first (a one-pointer!), but I usually do wheel landings for touch-and-go's. I fly off a grass runway and haven't had a problem with the wheel pants.

If you decide to build this model, good luck with it. It flies well and looks great in the air. There are several color schemes available for this famous racer, so take your pick.

See the Source Guide on page XXX for manufacturers' contact information.

FSP1005A **SHOESTRING YELLOW JACKET**



TO ORDER THE FULL-SIZE PLAN, VISIT RCSTORE.COM ONLINE.

At the recent Extreme Flight Challenge event in Troy, OH, Yuri Higuchi's Extra 330 lets it all hang out!

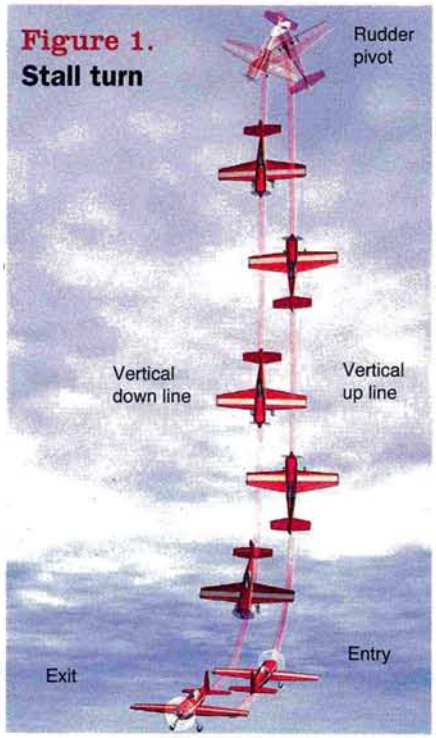
HOT-DOGGING IT

3 MANEUVERS TO SPICE UP YOUR AEROBATICS

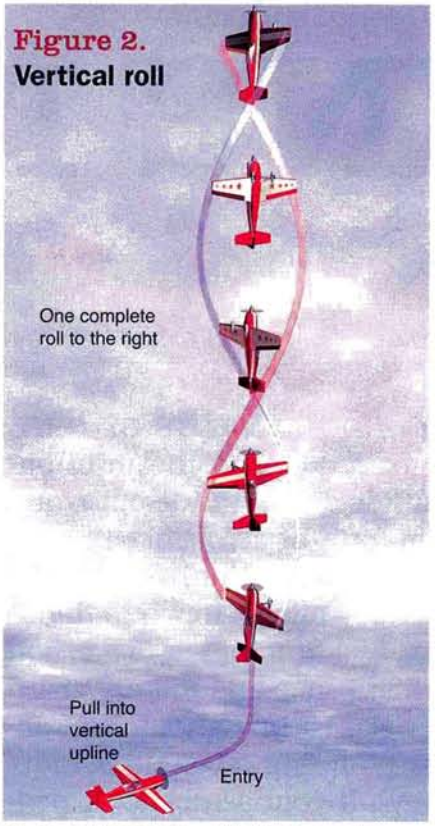
BY FRANK NOLL JR.
PHOTO BY DEBRA CLEGHORN
ILLUSTRATIONS BY FX MODELS

IF YOU THINK YOU'RE BOLD AND HAVE LOTS OF GRIT, you'll want to explore a place many RC fliers dream of but very few reach: the gyrating, upside-down, inside-out world of the hot-dogger. This freestyle form of aerobatics lurks at the fringes of precision aerobatics and pattern flying. The only difference is that a good hot-dog pilot is tough to find.

I like to think of hot-dog flying as a form of self-expression in which style is everything. When I snap and roll my giant-scale Yak 54 or one of my other giants through a show routine, my adrenaline really gets pumping (even after more than 40 years in this great hobby). If your aerobatics experience is somewhat limited, don't hesitate to try hot-dogging anyway; you'll set the sky ablaze in due course. But first, let's go over some technical basics for setting up your airplane.



The stall turn is one of the most basic aerobatic moves.



To do an impressive vertical roll, consider your model's best attributes.

RADIOS

When you choose a radio for hot-dogging, I suggest that you use a transmitter that's at least equipped with dual rates. I prefer it because it gives me additional control-surface throws. While flying on low rates, I can make my airplane as docile as a newborn pup; but when I kick in the high rates, watch out! My plane suddenly turns into a pit bull with an attitude.

Programmable radios offer even more exciting options than standard radio systems because they enable you to fly maneuvers while mixing out the airplane's bad tendencies, such as pitching to its belly (tucking under) and rolling out with rudder input. Standard transmitters just don't offer these self-correcting features.

BALANCING

Finding the ideal CG position for hot-dogging will take some experimentation. Obviously, most airplanes come with the CG position somewhat defined by their designers. But for the hot-dog jockey, this aspect must be changed. If you position the CG forward of the recommended spot, your airplane will be more stable on the upside of its performance envelope but sluggish on the downside. If you move the CG aft of the recommended spot, the control surfaces become sensitized, thereby enhancing the plane's handling. The only drawback to the aft CG location is that your plane is less stable. Keep pushing the CG around until you find an ideal spot that offers the most versatility in freestyle and hot-dog aerobatics.

HIGH-RISK ZONE

During your hot-dogging apprenticeship, you'll have to push yourself past your own "comfort zone." This takes lots of practice along with a few hits and near misses. Make the best of this learning experience; push yourself beyond this zone. A good way to begin is by continually slowing your plane until it stalls. Then correct the stall, and remember which inputs you used. Stall it upright; stall it inverted; and stall it in knife-edge, too. Know when and where it quits flying.

Always remember to loosen up before you fly hot-dog maneuvers. Do a few rolls, loops and whatever else you've learned along the way. Do variations of each. Change your approaches from left to right, and then reverse them. You'll be surprised by how quickly you'll pick up the basics. Practice them until they become as automatic as driving your car.

MANEUVERS TO START WITH

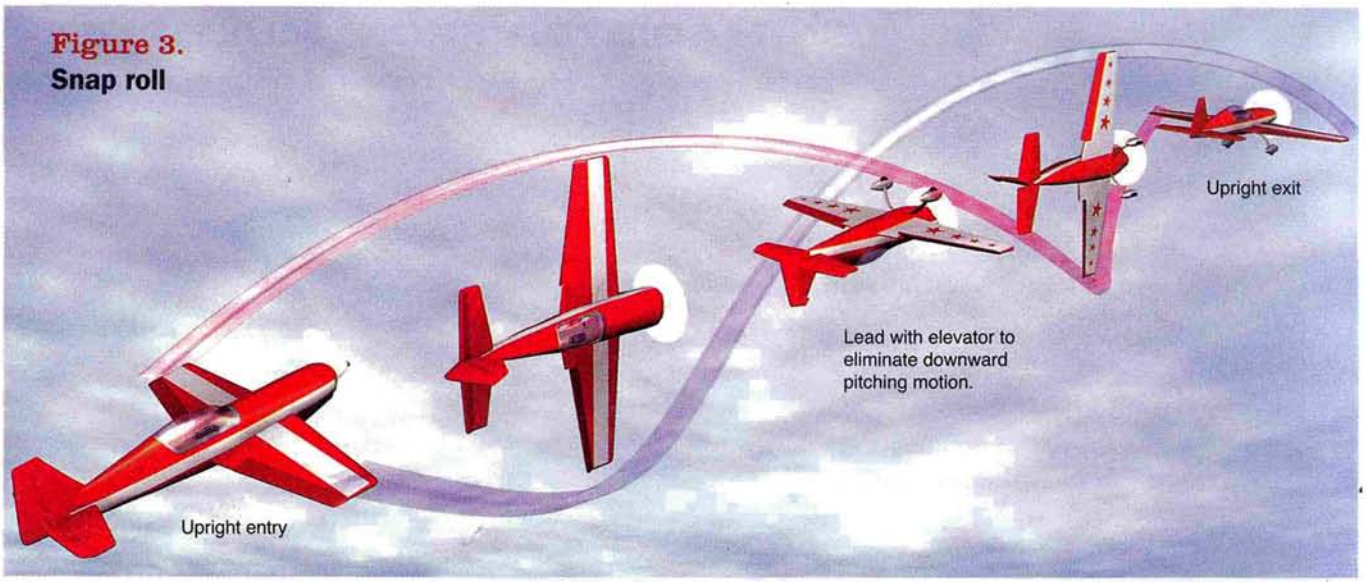
Basically, hot-dog maneuvers are offshoots of precision aerobatics; the only difference is that you cluster several moves into a sequence to make your routine livelier. It's all about action and reaction. *Model Airplane News* has published several excellent articles that show the most popular maneuvers—rolling circles, harriers and so on—but for now, let's look at some basic moves that can spice up your routine.

>Stall turns The stall turn (Figure 1) is the most basic move in freestyle aerobatics. It was probably the first "risky" aerobatic maneuver you learned. No matter how poorly you do it, you'll eventually master it, and you'll even stop flopping over at the top of the maneuver. A well-executed stall turn consists of nothing more than pulling your airplane up the vertical axis, allowing it to slow "just enough" and then throwing in some rudder. This rudder action pivots it around to fly back down the vertical axis it climbed.

In short, the key is to stay on the vertical line going up, pivot around without flying over the top and come back down the same vertical line. Flying over the top can be remedied by cutting back on the throttle until the plane slows down and then throwing in rudder input. A short blast of throttle also helps to pivot the tail over the top.

Another way to approach the stall turn is to align yourself with the airplane and fly it "dead ahead" in front of you instead of at either end of the flying field. With this new reference point, you'll be able to rotate the airplane directly in front of you so that its top faces ¼ turn to the right or left on the vertical line. Next, kick the rudder over until the airplane pivots onto its side and stops in a horizontal attitude (much like a knife-edge); then apply opposite rudder to stop the plane's momentum. After that, throw your initial rudder input back in. This will send the plane back down the same vertical line. All this rudder action at the end should give you a squared-off stall turn. There are several other stall-turn variations, but I'll save them for later.

>Vertical rolls Airshow crowds love vertical rolls (Figure 2). Like the stall turn, it's done on the vertical axis. The idea behind it is deception: the airplane seems to be doing more than it actually is. Do this by using the



For a good snap, lead with elevator before applying other control inputs.

best attributes of the airplane and the radio. The airplane should have optimum power for going ballistic, while the radio should be outfitted with rate differentials. If your plane's power is less than adequate, you can compensate by clicking on your high rate to generate more rolls in the vertical.

A simple way to practice this is to alternate rolling one way and then the other when ascending and descending. Again, make sure that you have enough altitude at the bottom to recover safely.

You can do vertical rolls in a variety of combinations, including 4- and 8-point segments going up and coming down. Mix combinations until you're proficient at exiting the maneuver at your desired heading. You'll get the hang of it. In addition, you don't have to keep the aircraft rolling up and out of sight. A stall at the top provides a nice recovery at the top of a 4-point vertical roll. Another escape route is to push or pull the airplane back over the top and end the maneuver straight and level, inverted or upright.

In my opinion, vertical rolls are easier than all the other rolling maneuvers because fighting gravity is easier than flying the horizontal line that dominates the rest of aerobatic flying. Another advantage is that they don't use as much area in the hot-dog box as horizontal maneuvers do. The payoff here is that everything happens right in front of you.

>Snap rolls Snap rolls (Figure 3) are those jumpy moves that suspend the action but then add to it. In a snap roll, you throw your airplane into a set of violent twists, rolls and other gyrations. The easiest snap roll is one that starts and stops in the upright position.

Confused? Don't be. Here's a tip to remember when doing a snap roll. Always lead your snap roll with the elevator before you move your other sticks in. This goes for the inside and the outside versions.

Leading with elevator eliminates the plane's downward pitching motion after it has recovered and exited the snap. Actually, the airplane's nose should be level or tilted upward somewhat to enable you to resume level flight without losing altitude. The elevator trick also helps when you do a one-and-a-half snap roll; it prolongs the airplane's level flight as it exits horizontally. You can do variations of the snap roll by stopping the roll in the knife-edge, but remember to plan your rudder inputs so that you'll be ready when the airplane stops snapping.

AIRSHOWS & FLIGHT DEMONS

People love airshows; they're real crowd-pleasers, no matter where you go. Giant-scale flight demos really rock the crowd just as their full-scale counterparts do. Many groups (fliers and non-fliers) invite me to show off RC hot-dogging moves. These people don't come to RC airshows to watch guys fly straight and level. They want the hot stuff with all the fixings, so give them what they came for: action!

When you're proficient at hot-dogging, you should develop its artistic side before you go out on the road and put on your own "show of shows." Music makes the soul soar, and it can make your performance soar, too. The type of music you use isn't as important as matching your program to the music. It will certainly make your performance memorable. Go for a good selection of tunes that people are familiar with. In my demos, I orchestrate several songs into one melody for a full flight segment. I begin with a slow song, move along to a more upbeat tempo, and finish with a beat that gets the crowd jumping. I look at music as the sizzle that sells the performance. Music makes me fly better because I interpret it and fly with it.

Choreographed flying such as that flown at the Extreme Flight Challenge (see the related article on the 2005 XFC event in this issue) is fun, especially when you match your maneuvers to the rhythm of the music—a smooth act that flows from takeoff to landing. I guess it's a lot like rubbing your head, patting your stomach and keeping the beat with your feet at the same time. It challenges fliers who have done everything else and are now looking for something beyond traditional precision work.

Hot-dogging, or freestyle flying, as it's sometimes called, continues to grow in popularity. There are now competitions all across the land, and hot-dogging is here to stay! It offers a thrill a minute for the public, and it's very rewarding for fliers who venture into high-risk flying.

23 WORKSHOP SECRETS

EASY SCRATCH-BUILDING TECHNIQUES, TIPS & TRICKS

BY MARK RITTINGER > ILLUSTRATIONS BY RICHARD THOMPSON

MARK RITTINGER HAS DESIGNED AND BUILT RC MODEL AIRPLANES FOR YEARS and has published many electric-powered warbirds. He has honed his techniques to make building them simple and quick. Many of his building tricks are also applicable to other designs, including glow-powered. This article highlights three of the do-it-yourself workshop secrets that Mark used to build his impressive Martin B-26 Marauder, which was published in the December 2004 issue of *Model Airplane News*. Follow along as Mark narrates, and you, too, will be able to enjoy the freedom of building from scratch. —*The Editors*

3 STEPS TO BUILDING A FOAM FUSELAGE

When I designed the Speed 400 Martin Marauder, I wanted to accurately re-create the B-26's sleek, cigar-shaped fuselage. Building it out of wood would have required many formers and a lot of strip planking. My approach was to make the fuselage and engine nacelles out of pink insulation foam. Although I show only the fuselage here, you can use the same technique to build the nacelles and then simply glue them to the wing panels.

YOU WILL NEED:

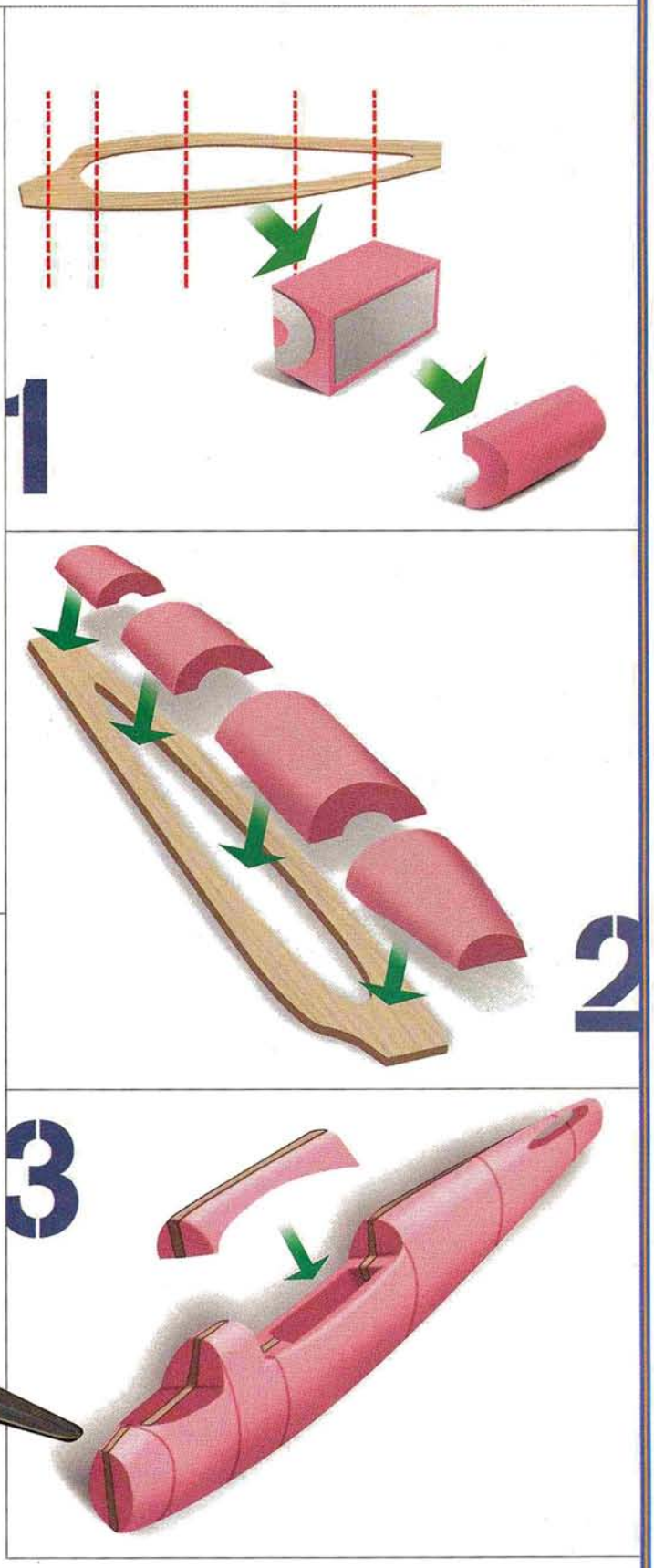
- ★ Heavy artboard for templates
- ★ 2-inch-thick pink insulation foam
- ★ Balsa
- ★ Sandpaper
- ★ Primer
- ★ .75-ounce fiberglass cloth and epoxy resin
- ★ Hot-wire cutter

[1] Use the fuselage sideview as a guide; then divide it into several sections. Make two slightly oversized side-profile templates for each section and one for each cross-section. Add approximately 1 inch to the inside ends of the cross-section templates to guide the hot-wire cutter. Leave about a ½-inch wall thickness.

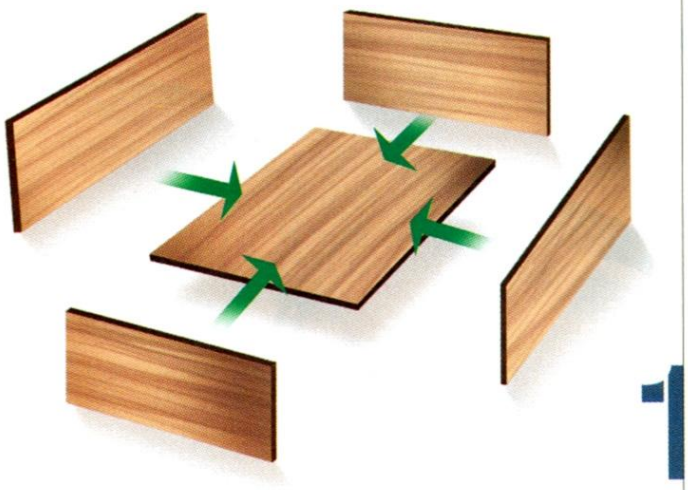
Draw reference marks on the ends of the templates, and pin them onto the foam sections. Pin the cross-section templates to the end of the appropriate section, and cut away the interior. Finish cutting the cross-section to shape by removing the outer portion.

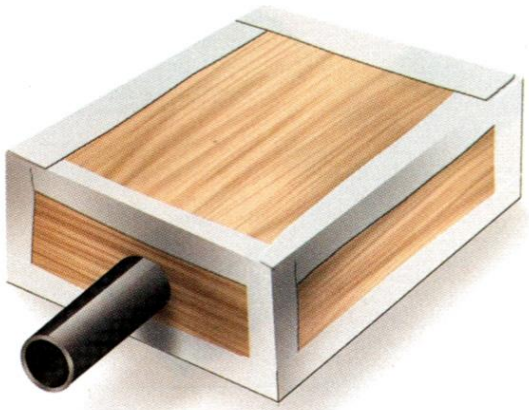
[2] After you've rough-cut all of the left- and right-side fuselage sections to shape, cut a center fuselage profile out of 3/32-inch balsa, and with the profile on a flat surface, glue the sections to the profile (I used Sig's Sigment glue). When the glue on the first side has dried, remove the profile from the workbench and glue on the second.

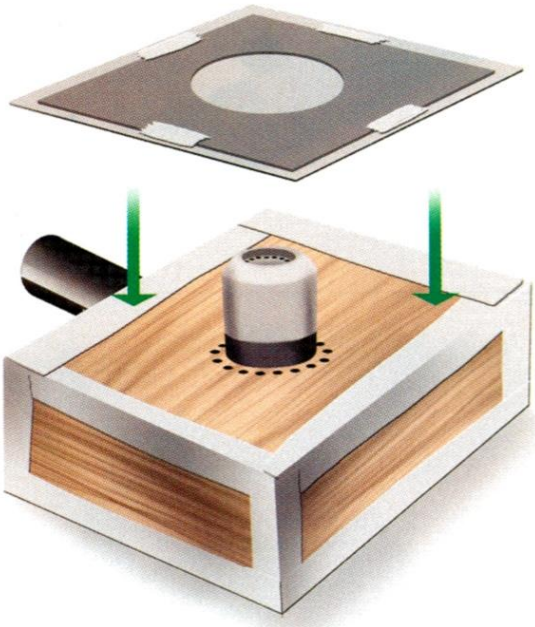
[3] After both sides of the fuselage have been roughly sanded to shape, use a sharp hobby knife, a carving knife, or a razor-saw to cut the hatches, wing-saddle openings, canopy cutouts, etc.



Here, the Marauder is ready to be finished with fiberglass cloth and resin. Apply a double layer to the belly section for increased ding resistance. The engine nacelles are made in the same way as the fuselage. Covered with aluminum-foil tape, the ready-to-fly, 42-inch-wingspan model weighs less than 37 ounces.







3 STEPS TO VACUUM FORMING

Once the basic fuselage has been finished, the next scratch-building step is to form canopies and other parts such as engine cowls, gun turrets and windscreens. After you make a plug, you can turn out cowls and canopies in short order. Here's how:

I used two pieces of 12x12x¼-inch lite-ply for the top and bottom and two pieces of ¼x3x24-inch basswood for the sides. Cut these in half to make the four 12-inch-long sides. One piece of 12x12x⅛-inch lite-ply is used for the frame that holds the forming plastic. Depending on your vacuum source, you will also need a piece of plastic pipe to match. Mine has a diameter of 1¼ inch.

I spent only $18 to make this vac box, and it took just one night to build. It's a simple wooden structure, and you need only basic hand tools.

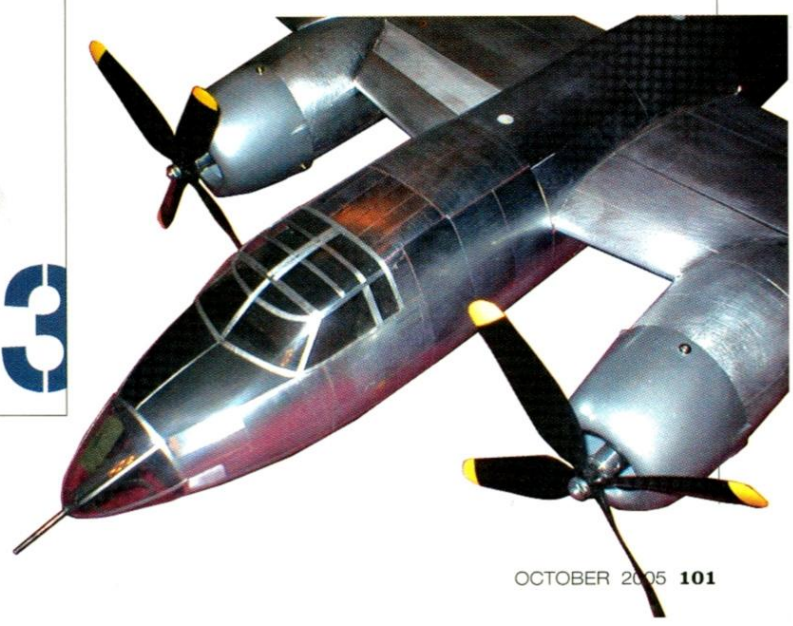
[1] Make the box by gluing the sides around the edges of the bottom piece.

[2] Cut the vacuum hole in one of the sides and then fit the pipe into the hole and glue it into place with silicone adhesive. Remove any debris from the box, then glue on the top of the box. To make the box airtight, use shipping tape to seal all the edges.

[3] Place your plug (here, a master for the engine cowl) on top of the box, and drill a series of ⅛-inch holes around its base. A thick spacer should be added to the bottom of the plug to lift it above the surface of the vac box. Note that I also drilled holes in the front of the plug to draw the plastic into the inlet. Attach the box to your vacuum source (an industrial shop vacuum will do nicely!).

Cut an opening in the frame about 1½ inches larger than your plug and then tape the forming plastic (I use 0.030 acetate) to the bottom of the frame. Cover the bottom of your oven with aluminum foil; then place four tall drinking glasses (make sure they are glass) in the oven to support the corners of the frame. Place the frame plastic-side down on top of the glasses, turn on the oven and heat it to about 300 degrees F.

Watch the plastic, and when it begins to sag, turn on the vacuum and quickly remove the frame from the oven (use hot-pads!). Push the frame (plastic-side down) over the plug and flat onto the box; then watch the plastic mold itself over the plug! Notice the plastic "webs" that form at the base of the spacer. The spacer prevents the webs from reaching the plug.



Making vacuum-formed parts involves a lot of trial and error, and it's rare to make a good part the very first time. I had to make four cowls before I made two good ones.

PHOTOS BY MARK RITTINGER

4 STEPS TO LIGHTWEIGHT HINGES

I am often asked how I create such lightweight hinges for my electric models. I make them out of the same film covering as I use to cover the rest of the model. They weigh virtually nothing and have never come loose in flight. Follow along while I show you how to make them.

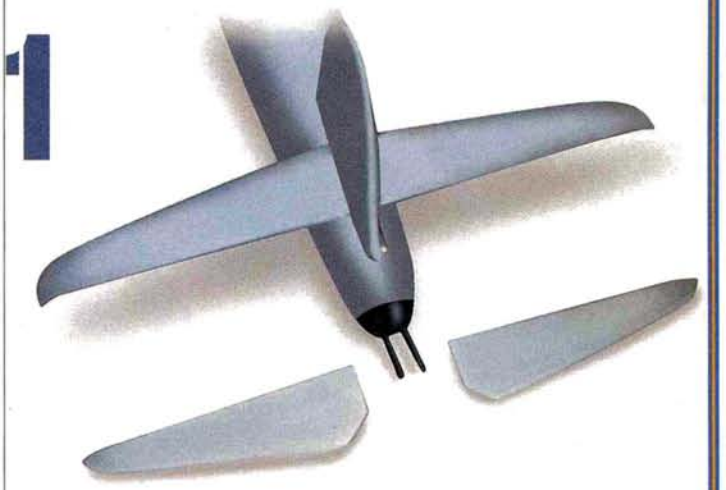
[1] This shows the Marauder's stabilizer and the elevators ready to be hinged together.

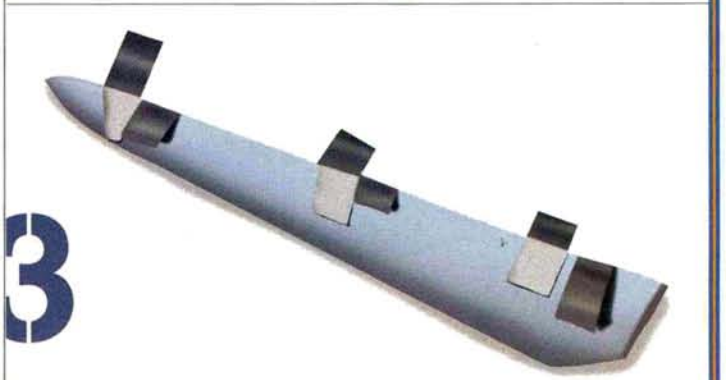
[2] Cut two strips of covering film about ¾ inch wider than your control surfaces. In this case, my stab is ⅛ inch thick, so the strips are ⅞ inch wide by about 6 inches long for the elevator. These will produce 12, ½-inch-wide hinges—enough for both elevators. I used silver film on the elevator and chrome film on the stab.

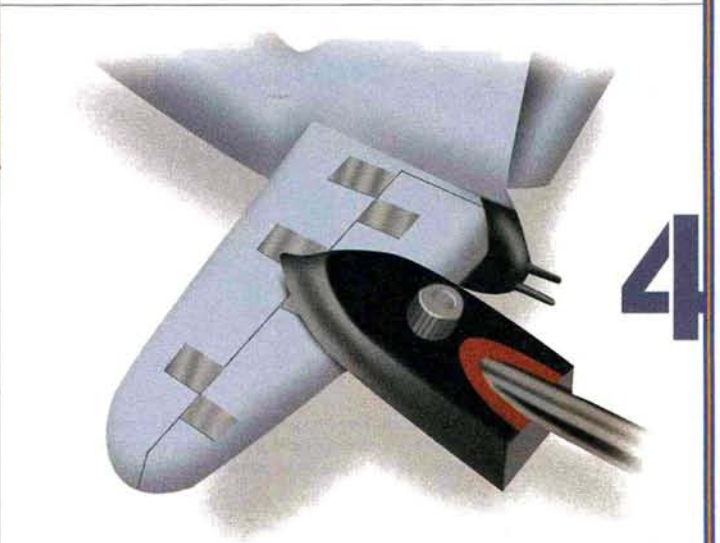
[3] On a clean glass surface, overlap the strips ⅛ inch, and iron them together (sticky side to sticky side) to form a single long piece of film firmly ironed together along the middle. Cut the strip (90 degrees to the overlap) into ½-inch-wide pieces to form the hinge segments. It will take two segments to make one hinge. One segment is ironed to the control surface; the other is ironed right next to the first but on the opposite side. Here, I have ironed the hinges to the elevator in alternating pairs. Do this for every control surface.

[4] Tape the control surface into place with the hinges positioned so that the adhesive sides lay against the fixed surface. Iron the hinges down while pulling them tightly into place. To ensure proper alignment, I ironed them in pairs.

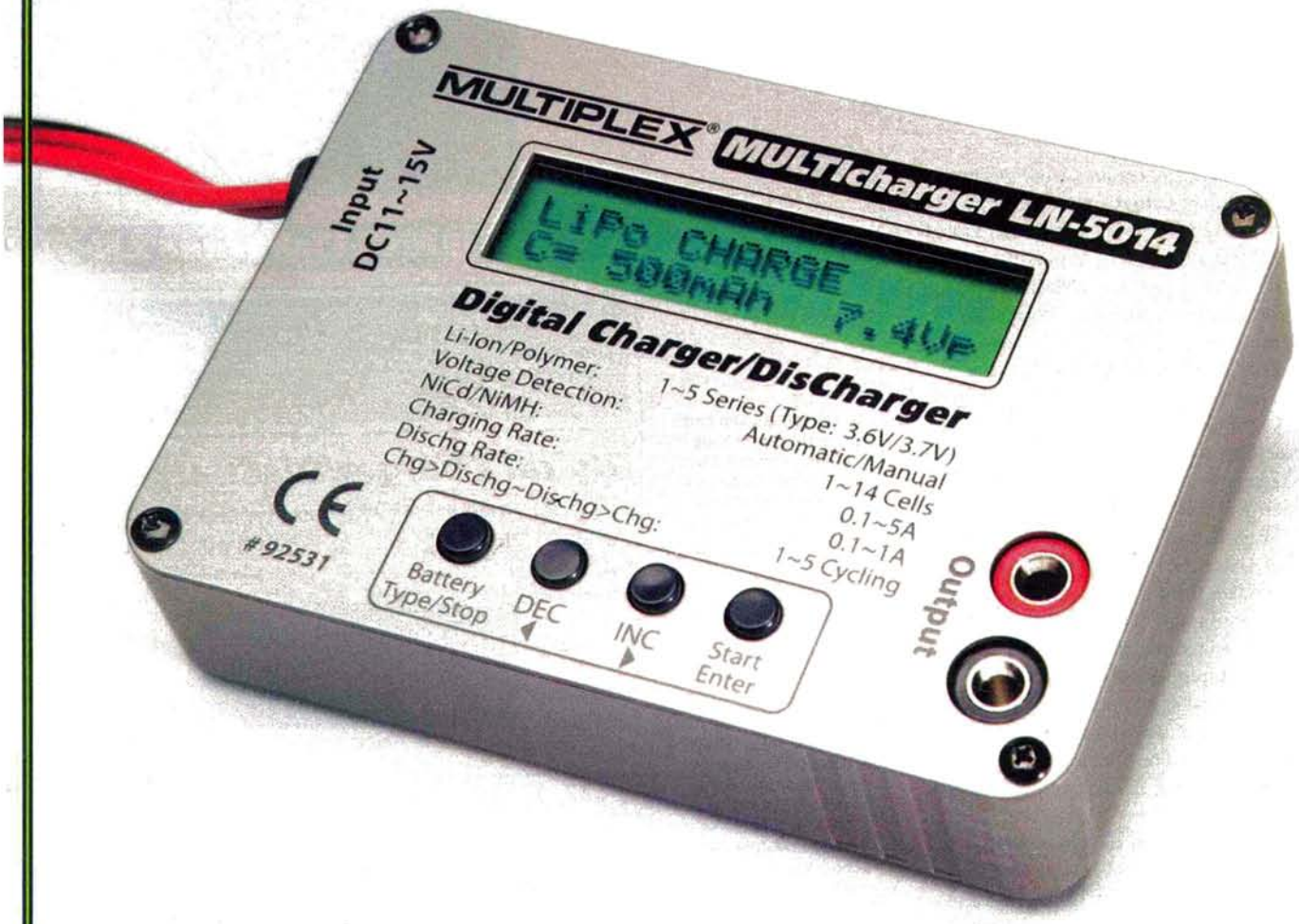
Here are the finished elevators, with three hinge pairs per side. This is more than adequate for a 2-pound ship. You can see that they are nearly invisible, and there isn't any binding. Quick, strong, simple—and best of all, very light!







TEXT & PHOTOS BY BOB ABERLE



CHARGE IT ALL!

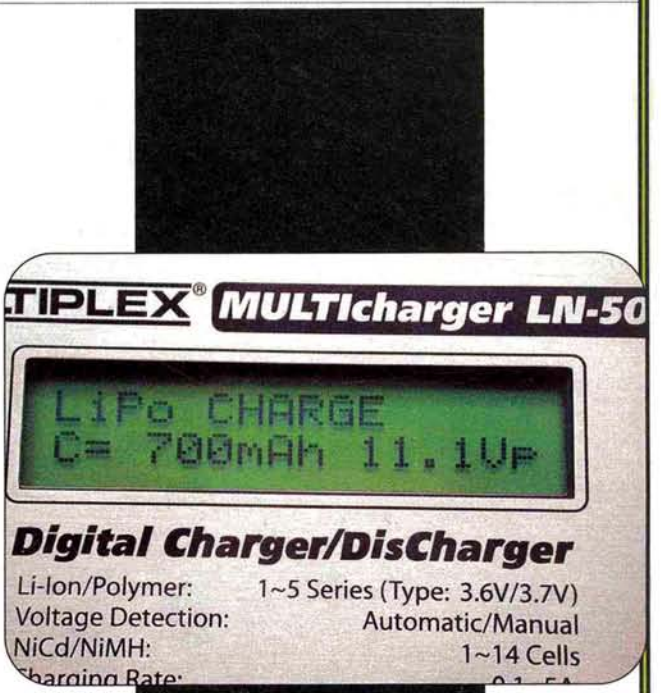
WITH THE MULTIPLEX MULTICHARGER LN-5014

If you're looking for a charger that can work with Ni-Cd, NiMH, Li-poly and Li-ion batteries, you're in luck: the new Multiplex LN-5014 Multicharger is capable of charging and discharging all of these cells, and it will also charge your 2 to 12V lead-acid batteries. With an $85 price tag, this versatile unit can handle all of your battery-charging needs at a very affordable price. Let's take a closer look.

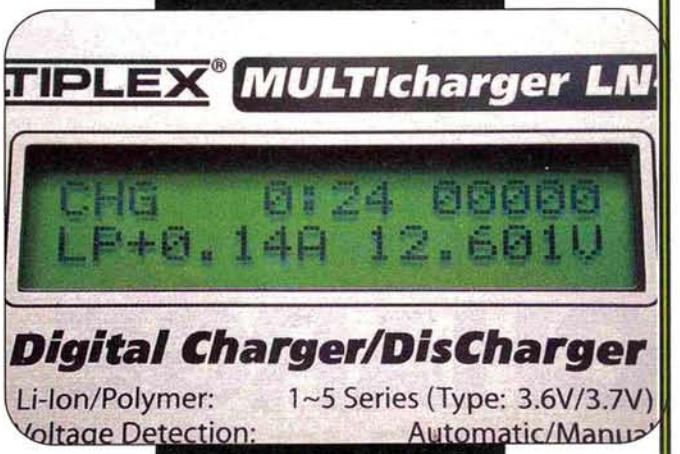
THE BASICS

The Multicharger requires a 12V DC input from a storage battery or a suitable AC-powered 12V DC power supply that's rated for at least 10 amps. It can peak-detect charge 1 to 14 Ni-Cd and NiMH cells at current levels from 0.1 to 5 amps in 0.1A increments. Because a 2C fast-charge rate is generally recommended for NiMH cells, you can fully charge packs up to 2500mAh in 30 minutes. Higher capacity packs will take longer to charge. A 3C fast-charge rate is recommended for Ni-Cd cells, so packs up to 1600mAh can be fully charged in 20 minutes. Again, it takes longer to charge those that have higher capacities, and remember: the unit's upper limit is 5 amps. It's important to charge Ni-Cd and NiMH packs at the proper current levels because improper settings can cause the charge to take too long or cause the batteries to overheat. The charger doesn't have a cooling fan or a heat sensor, so put it someplace where air can freely circulate around it.

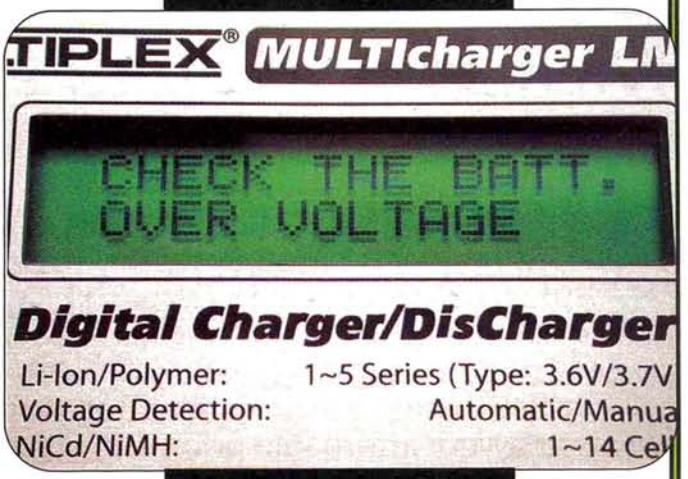
The Multicharger can charge both Li-poly and Li-ion packs (1 to 5 cells) and has a 4.2V cutoff per cell for Li-polys and a 4.1V cutoff for Li-ion cells. After you've selected the cell type, you input your battery pack's capacity. If you have a battery rated at 1000mAh, set the charger for 1Ah capacity, and it will automatically charge at a 1C rate. Your pack will be fully charged in about an hour. The last step is to set the charger to the number of cells in your pack, but you must select on the basis of cell voltage, and that requires a little more thought. Each Li-poly cell is 3.7 volts, so 2 cells are 7.4 volts, 3 cells are 11.1, etc. Li-ion cells have slightly less voltage. When you charge lithium batteries, it's very important that you set the charger to the number of cells in your pack. Improper setting could not only ruin a pack but also start a fire. To prevent that, the Multicharger has an excellent built-in warning system. If you set the charger for 3 Li-poly cells (11.1 volts) and attach a 2-cell battery pack, the unit will emit a loud, continuous alarm, the LCD will show "Check the Batt—Low Voltage," and the charge will be terminated. If you set it for 2 cells (7.4 volts) and attach a 3-cell battery pack, the alarm will sound, the display will read "Check the Batt—Over Voltage." Again, the charge will be terminated.



On this screen, you can see that a Li-poly pack has been selected. The capacity has been set to 700mAh. A 3-cell Li-poly pack is 11.1 volts.



When you press "Start" and hold it for a second or two, the charge process will start, and the LCD will look like this. The charger has been on for 24 seconds. The "00000" will eventually show the mAh input into the battery during charging. "LP" indicates that the battery is a Li-poly. The charge current at that moment is 0.14 amp, and this 3-cell pack is presently at 12.601 volts.



While this is displayed, an alarm sounds. In this case, I attached a 2-cell Li-poly pack and set the voltage for 3 cells (11.1 volts). The LCD screen indicates that I set the voltage too high, and the unit stopped the charging process—a great safety feature!

SPECIFICATIONS

Product: Multicharger LN-5014
Manufacturer: Multiplex
Distributor: Hitec RCD
Type: universal charger
Input: 12V DC
Input cable: 32 in.; terminates in a pair of alligator clips
Size: 4.5x3.25x1 in.
Output connections: conventional banana jacks (plugs provided); cable available separately
Cell capacity: 50 to 5000mAh
Charge current: variable from 0.1 to 5 amps
Discharge current: variable from 0.1 to 1 amp
Price: $85

FEATURES

Charges and discharges Ni-Cd, NiMH, Li-poly, Li-ion and lead-acid batteries; 12V DC input; alarm at end of charge or discharge. All battery parameters displayed on a brightly lit LCD screen.

HIGHLIGHTS

- Universal charging/discharging capabilities
- Handles a broad range of capacities and number of cells
- Works with lithium batteries in a very safe, conservative manner
- Large, well-lit LCD screen displays all important parameters
- Attractive price

DISCHARGING

Besides its charging capabilities, the Multicharger also allows you to discharge batteries using load currents that range from 0.1 to 1 amp in 0.1A increments. You can select a discharge cutoff voltage of from 0.1 to 16.8 volts. The unit also cycles (charges and discharges) Ni-Cd and NiMH batteries up to five times before the process is completed. In this cycle mode, only the pack's capacity in the last cycle is displayed at the end. Cycling in general, however, is designed to condition batteries that have been out of service for some time.

When you discharge lithium batteries, the Multicharger uses your cell selection to determine the voltage cutoff (approximately 3 volts per cell). That is generally accepted as the minimum voltage for lithium cells, so if you discharge a 2-cell Li-poly pack (with the charger set at 7.4 volts), it will be discharged down to 6 volts (3 volts per cell), and then the unit will cut off with that pack's measured capacity displayed on the LCD screen. Again, a safe way to do the job!

> "THIS IMPRESSIVE UNIT CAN HANDLE ALL YOUR CHARGING NEEDS"

ACCESSORIES

The Multicharger comes with a 32-inch-long input cable and an alligator clip to connect it to a 12V DC source. On the output side, you will need a cable that terminates in banana plugs. On the other end, attach a battery connector. Multiplex provides output cables at a reasonable price.

I worked with draft instructions, but by the time you read this, Multiplex will have a detailed manual for this unit. There are only four buttons on the front panel. To use all of the charger's features, you will have to navigate through the menu. Two of the four control multiple functions. They do different things at different times in the operating sequence. For example, when you start to use this charger, you must first select the battery type by pressing "Battery Type" a few times to scroll through the options. Next, you press "Start" to select the type and move on to setting the charging function (charge, discharge, or cycle).

If you select "lithium," you would select Li-poly or Li-ion in an intermediate step. Press "Start" again, and the charge or discharge current will flash. Now you select the current using the increase (INC) and decrease (DEC) buttons. Then press the "Start" button again, and the voltage will flash. This is when you set the charger for the number of cells you're charging, e.g., 1 cell (3.7V Li-poly), 2 cells (7.4V Li-poly) and so on. Now you are all set; press "Start," and the unit will begin to charge the cells. The LCD will tell you information such as time on charge, milliamp-hours going into or being drained from the battery, the type of cells, the set charge or discharge current and the voltage under load. These parameters displayed on an LCD screen are infinitely more useful than a series of flashing, colored LEDs. When the charge or discharge is complete, the charger will turn itself off and beep while "END" flashes on the screen. You can even retrieve data after the charge or discharge function is complete. That is the basic process, but the Multicharger offers many more features. With a little time and patience, you will master all of its functions.

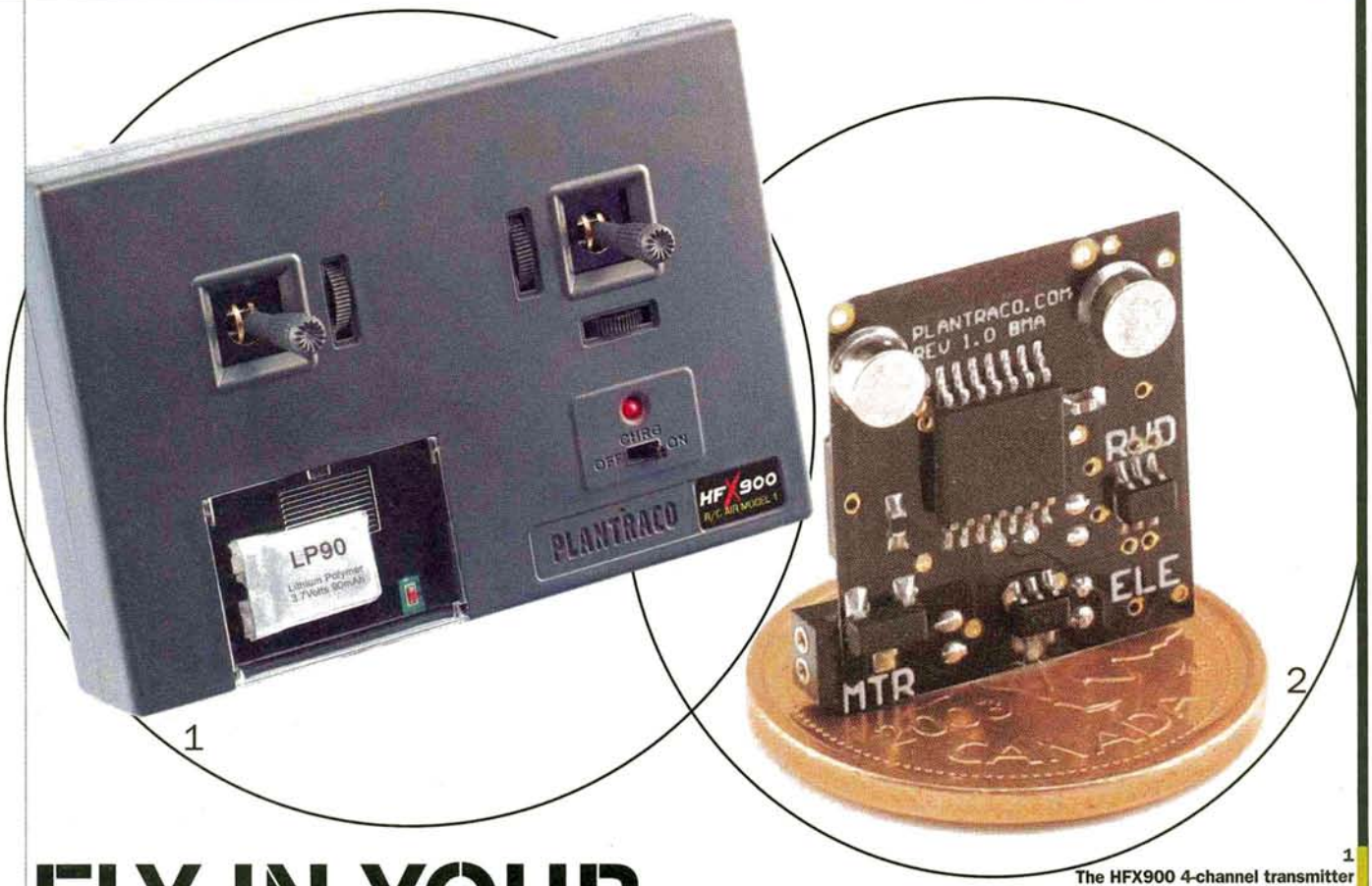
TEST RESULTS

I did not try to charge a lead-acid battery. I'm an electric-power enthusiast, and the only storage battery I own is in my car (and the car does the charging!). But rest assured, the Multicharger can charge a 2 to 12V lead-acid battery.

I spent several weeks putting the Multicharger through its paces. I deliberately made mistakes such as incorrectly inputting the number of lithium cells, and the safety functions worked perfectly. The unit safely performed exactly as Multiplex claimed it would. After you've learned to navigate the menu system, this unit can handle all your charging needs. It is an impressive charger at a very attractive price.

See the Source Guide on page xxx for manufacturers' contact information.

TEXT & PHOTOS BY LEN JOHNSTON



FLY IN YOUR LIVING ROOM!

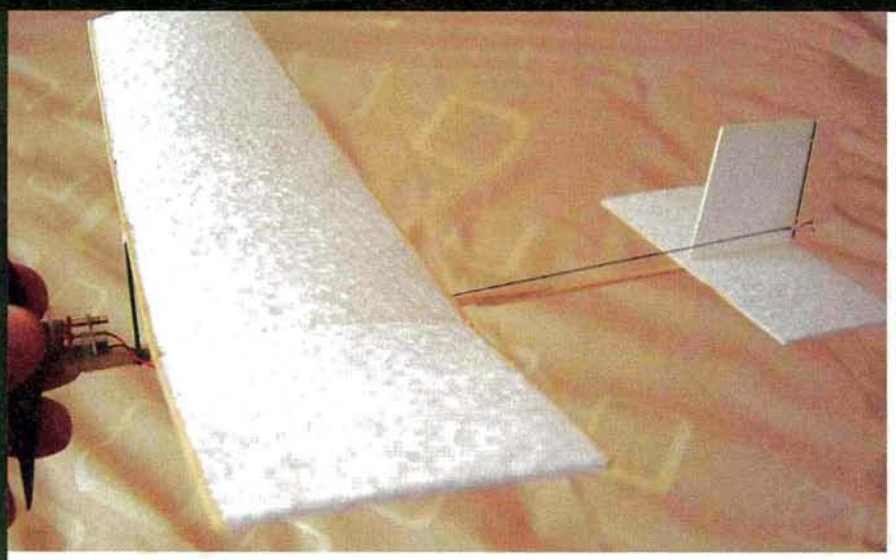
PLANTRACO'S HFX900 R/C SYSTEM

1
The HFX900 4-channel transmitter has many special features, including an onboard battery charger. It doesn't use crystals but instead offers three frequency options.

2
The 0.9-gram receiver is ½ inch square and comes wired with three tiny plugs for the battery, motor and servos.

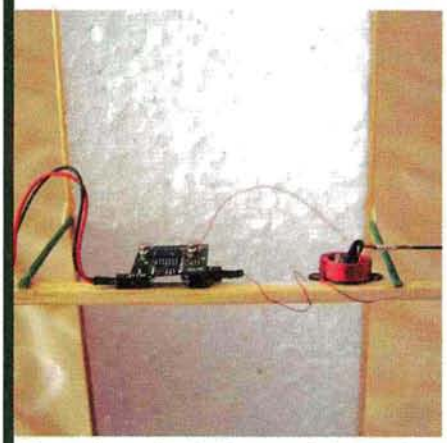
Have you ever dreamt of flying in your living room? Now you can—with Plantraco's tiny HFX900 900MHz radio system. This plug-and-play system is ready to go, straight out of the box; no soldering is needed to connect the actuators and battery with the tiny 0.9-gram receiver. (And believe it or not, that's the heavier of Plantraco's two receivers. The even lighter, 0.38-gram unit can be used to fly Plantraco's tiny, 7-inch-span Butterfly model. This amazing machine weighs just 4 grams, ready to fly.) I installed the HFX900 system in an 11¾-inch-span, 7-gram model of my own design.

The battery The system comes with Plantraco's patent-pending, Bahoma magnetic-battery connectors. In this groundbreaking system, two tiny magnets on the receiver are mated with two magnets on the included 90mAh Li-poly battery. The magnets replace not only the battery connectors but also the on/off switch. Just "snap" the batteries into place, and the system is powered up and ready to go; no more pulling on miniscule wires because your pudgy fingers can't get a grip on the tiny plugs! I've lost count of the number of lithium batteries that I've pulled the wires off when I tried to unplug the things to recharge them. No longer, though; this battery system is the best thing since sliced bread! Wipe any crud off the magnets before you try to attach them; mine had enough muck on them to prevent a good contact. These tiny magnets are incredibly strong and will pick up anything within range on the workbench. The charger that's built into the Plantraco transmitter uses the same connection system, so you always have a charged battery ready to go. Yes; the transmitter actually has a built-in lithium charger to top off your cells using its own internal batteries—no wall socket needed. This system is simply bursting with great ideas. Plantraco also offers lithium cells of other capacities that will match the system.



My scratch-built design weighs 7 grams ready to fly and is made mostly of 2mm-thick insulating foam. I spent only an hour building it. With elevator control, it would be quite aerobatic.

>>The transmitter The 4-channel, proportional transmitter requires 4 AA batteries and has a host of features in addition to being able to charge your airborne system battery. Two transmitter types are available: one has a spring-centered throttle stick, and the other has a standard, ratchet-type throttle stick. You must choose between them when you order.



The receiver and pushrod are attached to the fuselage boom. Note that the pushrod and components shouldn't be magnetic, or the system will jam up at full deflection (the magnet's pull on the metal wire pushrod end will exceed the coil's power).

You can charge your battery via the transmitter's internal batteries. Up to 10 charges are possible before you'll have to replace the transmitter's 4 AA cells.

The radio doesn't use any crystals; you use the transmitter stick to choose from three frequencies built into the radio. It also offers V-tail mixing and exponential—very handy if you fly delta wings or are flight-testing a new model. You can trim the controls with a wheel that's beside each radio stick.

A little door on the left side houses the battery when it's being charged, and you can also store a spare battery there. The transmitter doesn't have an aerial antenna; its high frequency means it can be housed internally (bonus: there's nothing to break at the wrong moment or to stick in someone's eye!).

When I tested the system, I achieved 70 yards of ground range. I challenge anyone to spot a small plane that far away! I am sure that the system would exceed the advertised 100 yards in the air. Control was rock-solid, even at the extreme end of the range.

As a bonus, the system comes with a free FMS flight simulator CD and a serial cable so you can connect the transmitter to your laptop. When it's being used in flight-simulator mode, the transmitter does not radiate, so others can fly when you are practicing on your laptop.

A warning here: if you use it with the flight sim, the transmitter will be in simulator mode the next time you turn it on, so remember to switch it to normal radiating mode.

>>The receiver At ½ inch square with the thinnest PC board I have ever seen, the receiver is tiny by any standard. The 0.9-gram unit comes wired with three tiny plugs for the battery, motor and servos. It doesn't have an on/off switch because the magnetic battery connection takes care of that reliably and without stressing the receiver's very thin PC board. The instructions advise that you support heavier batteries with a tiny piece of tape, but so far, I have not found that necessary; the system works perfectly as made.

I do think that the receiver's dipole antenna should be looped through the PC board instead of being attached with a very tiny blob of solder. Half of my antenna fell off, but this was easily remedied with a small soldering iron and a magnifying glass.

The receiver has built-in low-voltage protection: when the Li-poly cell drops below a safe voltage, the receiver cuts the throttle to 60 percent. When this happens, you should land immediately because the receiver will cut the throttle to 30 percent shortly afterward, and few models will fly on 30-percent power. The receiver's LED will blink a series of flashes to indicate the general state of the battery voltage. This is very useful if the battery isn't performing well because of its age, or you believe it isn't charged properly.

Plantraco notes that even lighter receivers are in the works. Mind-boggling!

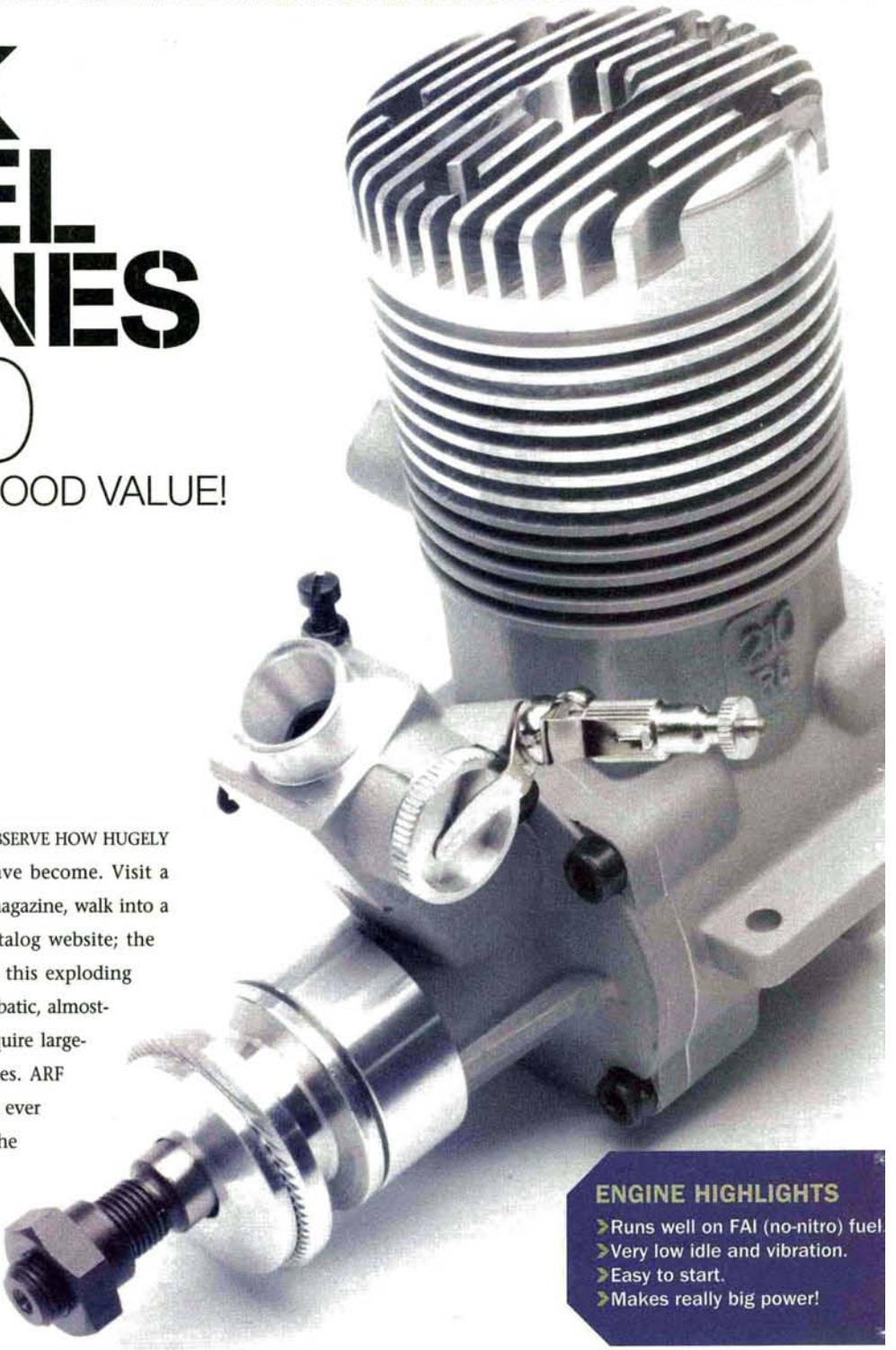
>>The actuators Actuators are not servos, but they behave like them, so you won't notice any difference when your model is flying. Those supplied by Plantraco weigh 1.1 grams each and use pushrods. A piece of aluminum wire or thin copper rod will work perfectly, and it's easy to form the Z-bends needed to connect the pushrod to the actuator arm. I have to confess that although the actuators worked perfectly and had more than enough power, I found the mounting system to be less than user-friendly.
To sum up, the HFX900 R/C system is a brilliant offering from Plantraco. From its plug-and-play convenience to its innovative battery attachment, the HFX900 is a giant leap forward for micro RC. Well done! ✈

See the Source Guide on page xxx for manufacturers' contact information.

BY BRUCE SMITH > PHOTOS BY BRUCE SMITH & DERON NEBLETT

MARK MODEL ENGINES M2.10

A POWERFULLY GOOD VALUE!



ENGINE HIGHLIGHTS

- Runs well on FAI (no-nitro) fuel.
- Very low idle and vibration.
- Easy to start.
- Makes really big power!

IT DOESN'T TAKE A ROCKET SCIENTIST TO OBSERVE HOW HUGELY popular giant-scale aerobatic aircraft have become. Visit a hobby trade show, open any RC aircraft magazine, walk into a hobby shop, or log on to any hobby catalog website; the choices are overwhelming. Embedded in this exploding sector of the hobby are 80-inch-span, aerobatic, almost-ready-to-fly (ARF) and kit models that require large-bore glow and 50cc-class gasoline engines. ARF manufacturers are building these aircraft ever lighter, thereby frequently compromising the structure needed to support and sustain the considerable torment of vibration that all gasoline engines—which increasing numbers of us are choosing—seem to have in common.

Almost totally overlooked are the big-block glow engines that vibrate, weigh and cost less and are simpler to operate. These glow babies are ideal mates for 80-inch and larger aircraft. I suspect that misconceptions such as "Large glow engines don't perform as well as gas engines," "Glow engines consume lots of expensive fuel" and "Glow engines just aren't 'trick' enough" are not easily dispelled. I've heard all of these remarks before, and admittedly, I've been tempted to give them some credence. After all, who would think that a 35cc glow engine could keep up with a 50cc gasser? Given the disparity in displacement, it's easy to draw erroneous conclusions. The fact is that methanol alcohol is the approximate equivalent of 150-octane gasoline and makes substantially more power per volume. I submit to you that this engine review will change the way you think about running a big-block methanol glow engine, and the quality and performance of the Mark M2.10 will make a believer out of any skeptic.

MARK M2.10

If you think that this engine looks like the Moki 2.10, you are right; but there are significant differences. Mark Model Engines are manufactured by Remek Motorok Kft., the company that, under various former names, has built the Moki line of engines since 1957. Remek Motorok of Budapest, Hungary,

SPECIFICATIONS

ENGINE: M210RC
MANUFACTURER: Mark Model Engines
TYPE: big-block glow
DISPLACEMENT: 2.11ci (34.6cc)
BORE: 36mm
STROKE: 34mm
RPM RANGE: 1,350 to 10,000
HORSEPOWER: 4.5 at 10,000rpm
THRUST: 28 lb.
HEIGHT OVERALL: 5¾ in.
HEIGHT FROM CENTERLINE: 4⅝ in.
WIDTH AT MOUNT: 3 7/32 in.
WIDTH AT CRANKCASE: 2 13/32 in.
LENGTH TO PROP WASHER: 5 in.
LENGTH OVERALL: 6 9/16 in.
WEIGHT: 2.8 lb. w/out muffler
PRICE: $320

FEATURES

Perfectly matched piston/sleeve; die-cast crankcase; micro-rib finish on pistons allows use of synthetic lubricants; fore and aft transfer ports; carburetor has 10mm venturi.

has maintained a high standard of performance and precision in model aircraft engines for decades, and for this, we can thank the "make-work projects" of the former USSR and an extremely talented engine designer named Gyula Kriszma. Now in his late 70s and funded by a free-market economy, Gyula still punches the clock at Remek every week. Many of us in the U.S. know the Moki moniker but not that of Mark.

Mark Model Engines' products were designed specifically for the German market and have been in production since 1995. Mark's engines were the first at Remek to be completely produced on new CNC machinery that, when combined with hand-crafted components, ensures perfectly matched piston and sleeve tolerances. It's this close tolerance that requires vigilance in the selection of lubricant type and content. A Mark engine's gravity-die-cast crankcase is made of a high-quality casting material that has been heat-treated to make it incredibly strong. Mark pistons have a micro-rib finish that permits the use of synthetic lubricants because they adhere better to that type of surface. Engines that maintain close piston/sleeve tolerances have traditionally been designed to use pure castor oil. Mark engines are designed to very high levels of refinement, metallurgy and performance.

Precise machining is evident in the 12mm crankshaft and prop-hub assembly.

The cylinder head is machined out of a single piece of aluminum and a hemi combustion-chamber design.

A view of the cylinder bypass porting.

METHANOL, NITRO & LUBRICATION

As mentioned, Mark engines have special properties that enable them to use synthetic lubricants; the manufacturer, however, stipulates that "synthetic-only" fuels should *not* be used because of the precise piston and sleeve clearance. As a result of this tighter fit, pure synthetic lubricants can't compare with castor oil for protection and lubrication at higher temperatures; therefore, Mark recommends fuels that have at least 20-percent castor oil in the total volume of oil. Mark engines are designed to have higher compression, and this enables them to make excellent power without using any nitro, as with FAI (no-nitro) fuel. Although the manufacturer notes that a nitro content of 5 percent is acceptable, up to 12-percent nitro can actually be used if you take into account that the main byproduct of nitro is heat, and high-compression engines don't do well with a lot of heat. If the nitro content is increased, the volume of lubrication should be also. Bumping the nitro content higher than 12 percent will likely result in detonation—a noticeable metallic resonance in the engine and, ultimately, holes burnt in the top of the piston. If you combine lots of nitro with all-synthetic lubrication, which lacks the property of pure castor oil (i.e., protection at high temperatures), you have a recipe for toasted engine. As is shown in the performance results, I found only a slight increase in thrust using 10-percent nitro, and in my opinion, this amount of nitro doesn't warrant the additional cost; it's potentially the most expensive component in glow fuel (based on percentage of volume).

FUEL BLENDING 101

I've been into big-block glow engines for a while now, and it's hard to ignore their fuel consumption—typically, around 2 ounces per minute. Although 50cc gassers drink at the same rate, $2-a-gallon fuel costs aren't a deterrent. Oil volume per gallon of gasoline is relatively small as well: a quart of premium 2-stroke covers quite a few gallons of gasoline. On the downside, not only does gasoline offer less performance than methanol, but the side effects of breathing in gasoline fumes are also factors that most people ignore. In comparison, methanol burns cleaner than gas without releasing hydrocarbons.

PORT TIMING

PORT	OPENS (deg.)	CLOSES (deg.)	DURATION (deg.)
Crankshaft intake	40 ABDC	58 ATDC	198
Intake transfer	58 BBDC	55 ABDC	113
Exhaust	75 BBDC	70 ABDC	145
Intake/exhaust overlap	110 deg.		

All measurements are from TDC
Key: TDC = top dead center; BDC = bottom dead center; A = after; B = before

The piston has a single compression ring and a hardened wristpin.

But what does FAI fuel really cost? Did you know that premium-grade, racing-quality methanol alcohol costs only $2.50 a gallon and is easily found at Go-Kart and automotive-racing shops? Lubricants are available there, too, and at hobby shops and online. Let's do the math: methanol alcohol costs $2.50 a gallon, 23 ounces of lubricant is required to make a gallon of fuel that's 18-percent total oil by volume (e.g., Klotz KL-100: 80-percent synthetic plus 20-percent degummed racing castor). Cost is 23 cents per ounce, or $5.39; the total cost is $7.89 per gallon for home-brewed FAI fuel. If you add nitro, Klotz Nitrol KL-601 costs $8.67 per 16 ounces, which equals 10-percent nitro per gallon. Turning FAI fuel into 10-percent-nitro fuel roughly doubles its price. Unfortunately, most engine designers and manufacturers design their engines specifically to use nitro—for the American market, that is. Mark engines are designed specifically to use FAI fuel. No nitro means no additional cost. And if you mix your own FAI fuel, you can save a bunch of money.

DECONSTRUCTING THE M2.10

As mentioned previously, the M2.10's crankcase is very strong. It has two large transfer ports, one fore and one aft, and is sandblasted for a final finish. The crankshaft is a stout 12mm at the prop thrust washer, it's made of hardened steel and has a mirror-like shine, and it's supported by two massive ball-bearing races. The piston uses one compression ring, sports the new, micro-rib, textured surface that aids the adhesion of synthetic lubricants and uses C-clips to retain the hardened-steel wristpin. The piston skirt is notched front and back for transfer-port clearance. The piston sleeve divides the transfer ports into pairs, is hard-chrome-plated and is flawlessly finished. All Mark Engines' pistons and sleeves are hand-measured and matched to ensure the close tolerances required. The M2.10's aluminum piston rod is contoured with radiused edges and incorporates bronze bushings top and bottom, and a slit at the bottom end allows excellent oiling. The cylinder head is machined out of solid billet-aluminum bar stock and has a hemispherical combustion chamber and squish band (head shim). The carburetor is the finest you will find anywhere. All parts fit and operate smoothly and precisely, the needle valve is canted backward, away from the propeller for additional safety, and the low-speed-mixture adjustment is easy to set without tools. The carburetor's generous 10mm venturi feeds the engine thoroughly yet is renowned for its dependable idle. Every engine part is extremely well crafted, and the machine work is excellent!

RUNNING THE M2.10

A reasonable break-in period for this engine is recommended. I began with a gallon of FAI blended 18-percent total oil by volume—80-percent synthetic/20-percent degummed

PERFORMANCE EVALUATION TESTS

TEMPERATURE: 72 deg.
HUMIDITY: 64 percent
BAROMETER: 29.76

Bisson Pitts-style muffler (stock)—2, 10mm-i.d. exits
FAI (no nitro)—18-percent oil (80/20 synthetic/castor blend)

PROPELLER	APC 20x8W	APC 21x10W	BME 21x8	NO LIMITZ 20x8	NO LIMITZ 20x10	NO LIMITZ 22x8	PRO ZINGER 20x10	PRO ZINGER 22x8
DB	95	93	94	96	94	94	95	95
RPM	7,260	6,150	6,360	7,200	6,990	6,510	7,200	6,960
THRUST (LB.)	21	20.5	20.5	20	20	20.5	18	19

Bisson Pitts-style muffler (modified)—2, 14mm-i.d. exits
FAI (no nitro)—18-percent oil (80/20 synthetic/castor blend)

PROPELLER	APC 20x8W
DB	96
RPM	7,500
THRUST (LB.)	24

Open port
FAI (no nitro)—18-percent oil (80/20 synthetic/castor blend)

PROPELLER	APC 20x8W
DB	108
RPM	7,450
THRUST (LB.)	25

Macs Muffled Tuned Pipe
FAI (no nitro)—18-percent oil (80/20 synthetic/castor blend)

PROPELLER	APC 20x8W	BME 21x8	NO LIMITZ 20x8
DB	96	93	96
RPM	7,890	6,600	7,800
THRUST (LB.)	27	24	25

Macs Muffled Tuned Pipe
10-percent nitro, 20-percent oil—(80/20 synthetic/castor blend)

PROPELLER	APC 20x8W
DB	95
RPM	7,800
THRUST (LB.)	28

The needle-valve assembly is canted back away from the prop.

castor oil. I then switched to a gallon of Wildcat 10% nitro, which has the same oil composition. Although I ran two gallons through the engine before I started my performance tests, I feel that running ½ gallon through it will tell you whether it's ready to get airborne. If the rpm don't sag when you're well into a tank of fuel, you are ready for your first flight. My engine ran extremely well from the get-go and showed steady rpm readings through the entire tank of fuel. High-speed needle settings were easy to find but were not overly sensitive, and the engine didn't tend to wander at the best setting. The low-speed-mixture control became easier to set as run time increased, and the idle and throttle transition also improved.

After break-in, I found the idle steady and dependable at 2,250rpm, and it really smoothed out at 2,850rpm. The engine's best feature was its very low vibration all through the rpm spectrum. Aside from low-idle vibration—a challenge for any engine—the M2.10's low vibration levels were fantastic.

GETTING STARTED

The Mark M2.10 doesn't include a glow plug, and its higher compression ratio requires a "cold" plug to avoid pre-ignition, or detonation. I used the McCoy MC-9 for all my testing, though the Rossi R-8 is excellent, too.

To start, be sure to have this thing bolted down to something strong (or have a helper nearby who can hold your aircraft, if you intend to run the engine installed). Follow the manufacturer's recommendations for propeller length and pitch; make sure that it's carefully balanced, and just say no to nitro—at least, for the first gallon. If you have the fuel tank close to the engine, be sure to have the tank's centerline aligned with the carburetor; if the tank is farther away, use an aftermarket fuel pump such as a Varsane, which requires the installation of a pressure tap on the engine's backplate. You do not want to run this engine lean; if you do, please make certain that you have at least some percentage of castor oil in the fuel. Castor protects against lean engine runs because as heat breaks it down, it actually becomes more protective. Castor is thermally unstable—but in a good way. Go figure!

Like most other big-block glow engines I've run, the M2.10 likes a good, "wet" prime (that's *wet*—not drowned). Open the throttle, and either cover the venturi with your finger or cover the exhaust pipe, and then flip the propeller over a couple of times. Remove your finger, and flip the propeller a couple more times; you should now see fuel squirt into the open venturi. Close the throttle to fast idle, and either flip it backwards or forwards; it doesn't matter which because this engine doesn't kick unless it's really flooded (read: drowned). My engine fired and ran on the very first flip. I like it when that happens!

Remove the glow driver, advance to full power, and set the needle for rich; allow the first few runs to be short and wet, and allow the engine to cool between runs. The manufacturer and distributor have very useful break-in info on their websites.

CRUNCHING THE NUMBERS

Making sense of the seemingly cryptic data is achieved as follows: I started with a selection of propellers that have provided me with encouraging performance data in the past; I have used some of them to evaluate 50cc gas engines. Of those, I chose the three most promising propellers and then selected the best performing propeller based on thrust and, in the case of the M2.10, rpm. I began with a Bisson Pitts-style muffler with the ends of the down pipes pinched. Although these restricters cut a few decibels, they really beat the power potential out of the M210. To demonstrate this, I sawed off only the crimped ends, and I retested the engine with exactly the same fuel and settings. The resulting 1dB noise increase could not outweigh a gain of 240rpm and 3 pounds of thrust!

For the ultimate performance tests, I bolted on a Macs 4230 header and 1096 Quiet Pipe. The beauty of this combination is that the header fits inside the end of the tuned pipe; to tune the system, you "trombone" the pipe forwards and backwards to find the optimum rpm and tuning without having to cut off any of the header pipe. I found the best pipe length to be 28¾ inches from the centerline of the exhaust port to the end of the tuned pipe. Last, I bumped the fuel to a 10-percent-nitro shot and, once again, I ran the best producing propeller, and this resulted in 28 pounds of thrust. Note that the tuned pipe's rpm and thrust readings exceed the open port reading (totally unrestricted exhaust), thus proving the "supercharging" properties of the tuned-pipe system. The pipe sounds pretty cool, too!

All propellers behave uniquely when coupled with specific engines. Their weight, dimensions, blade profiles and contours all factor into that engine's performance characteristics. Ultimately, thrust is what I judge to be most important, but noise (dB) or aircraft type may determine the best alternative for your particular application.

> "**the Mark 2.10** will make a believer out of any skeptic."

According to Remek, the top of the power curve for the M2.10 is 11,000rpm, which my tests did not even approach. This makes me wonder what a 19x8 or a 20x6 prop might do with the modified Bisson or tuned pipe. I did, however, manage to pull 28 pounds of thrust on a modest quantity of nitro and 27 pounds of thrust with no nitro, so I'm not complaining. Needless to say, this engine has a lot of undiscovered potential. By the way, 28 pounds is more thrust than any 50cc gasser I've tested has produced using a muffler. In an 80-inch-span aerobatic airframe, 27 pounds of thrust equals ballistic!

WRAP-UP

Without doubt, this is a great engine. The M2.10 is easy to start, runs great, idles great, has very low vibration and makes really big power without the crutch of nitro that so many other engines lean on. It was a pleasure to run this engine; I can't say it any more plainly than that. That Morris Hobbies sells the M210 for roughly half the price of a high-performance 50cc gas engine makes me wonder why anyone would shell out twice as much for a less impressive powerplant. I'd rather buy a second M2.10!

See the Source Guide on page xxx for manufacturers' contactinformation.

This impressive G-62-powered model was designed and flown by Nick Ziroli Sr. The Beechcraft Staggerwing's original designers wanted to install retractable landing gear in its bottom wing, which required it to be positioned forward of the top wing.

BRAWNY BIPES

TEXT, PHOTOS & ILLUSTRATIONS BY GERRY YARRISH

I JUST LOVE BIPLANES AND OTHER MULTI-WING aircraft! The more wings, the better, I always say, and when it comes to giant scale (60-inch wingspans and larger), biplanes really shine. Yes, you do have to build more wing panels, but you get a lot of fun for your efforts! If you've never built or flown a biplane, here's a look at some of the characteristics that add to their appeal.

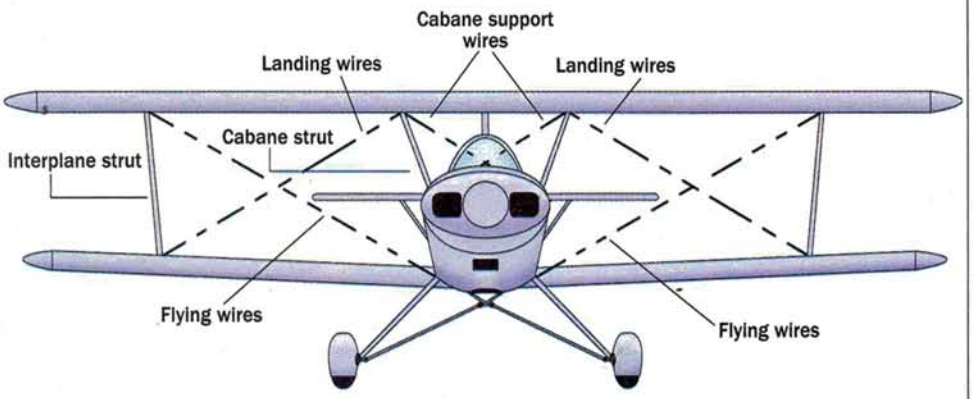
Structurally, biplanes have smaller wingspans and shorter fuselages than monoplanes with the same wing area, and this allows quicker control responses. When combined with the interplane and cabane struts and the wire rigging, the upper and lower wings produce a very light and torsionally strong structure (see Figure 1). The wings don't have to be built to bear all of the flight loads alone. Scale model biplanes that have functional rigging wires take advantage of this construction and have relatively light wing loadings. Model biplanes, however, don't have to depend on functional rigging wires. They can have a stronger D-tube wing construction, but it comes at the expense of a somewhat higher wing loading because of the increased wing-structure weight (Figure 3). With the rigging wires eliminated, biplanes become much less complicated to assemble.

This beautiful Fairey Swordfish is the work of Richard Crapp. Its functional rigging wires give it great strength.

This high-performance Bulldog Pitts doesn't need rigging wires.

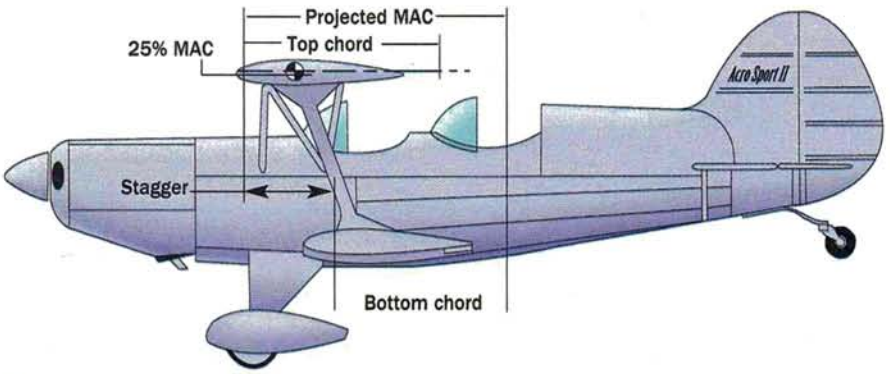
One of the newest ARF bipes is the Great Planes military Stearman PT-17. It doesn't need functional rigging wires; those you see here are just for looks!

Figure 1
Biplane structure and rigging



Biplanes get their strength from the rigging wires that support the two wings. Landing wires take downward-force loads during landings, and flying wires support the wings during upward loads (while flying). The interplane struts and the cabane tie the two wings and fuselage framework together to form a structure similar to that of a truss bridge.

Figure 2
Simple balance point for a constant-chord, straight-wing biplane



When the top and bottom wings are the same (i.e., straight with equal chord widths), add the wing stagger to the bottom wing's chord to determine the Mean Aerodynamic Chord (MAC). Then balance the model at the 25% MAC location at the top wing.

Aerodynamically, a biplane's wings produce more drag and are a bit less efficient in generating lift. Two wings do, however, allow biplanes to stall at a higher angle of attack than that of a similar airfoil section used in a single-wing configuration. Except for the heavier, aerobatic designs, biplanes also possess gentler stall characteristics, although this depends on the airfoils used.

Increased drag is the major difference in biplane flight characteristics when compared with monoplanes; biplanes slow down more quickly when you reduce throttle and will take longer to speed up when you apply power.

THE BALANCE POINT

When I built my first biplane, I heard all sorts of complicated formulas to figure out where the balance point should be. For typical biplanes with straight wings of equal chord, there is a simple way! Add the amount of wing stagger to the bottom wing's chord to determine the model's mean aerodynamic chord (MAC). Then balance the model at the 25-percent point of the MAC, measured back from the top wing's leading edge (Figure 2). This gives you a safe starting point for that first flight. For biplanes with one or more swept wings or for models with two different wing

FUJI 43: THE NEW POWERHOUSE ON THE BLOCK

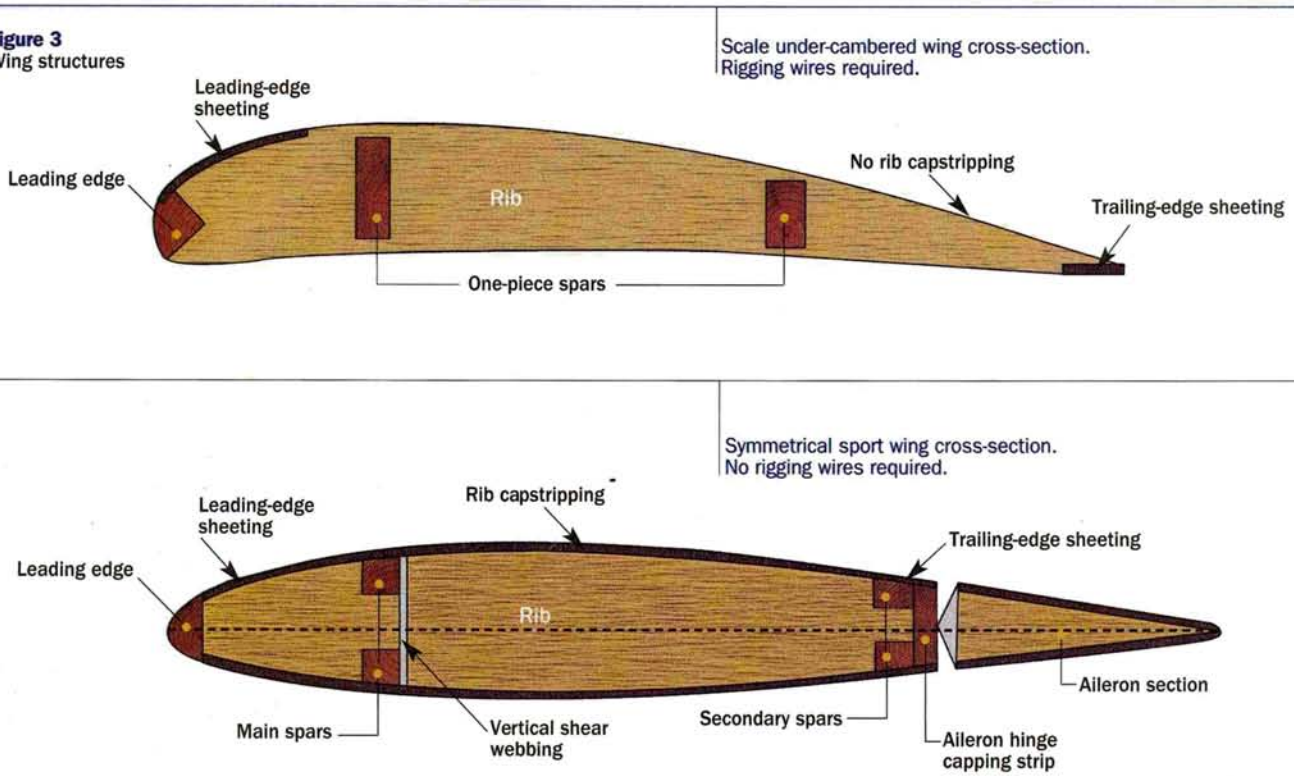
Greg Hahn recently won the title "Mr. Top Gun" at the 2005 Scale Invitational. He flew a big. beautiful B-25 Mitchell bomber (see the September 2005 issue of *Model Airplane News*), and he also won the Best Gas Performance award! Powering his 10-foot-span, 46-pound beauty were two new Fuji BT-43EI engines. These compact powerhouses turned 22x6/10 3-blade props without any problems at all. Greg enjoyed more power and torque, and the engines fit perfectly inside the cowls!

As with all Fuji gas engines, the BT-43EI features a user-friendly Walbro carb with a made-for-RC throttle linkage and an electronic ignition system that automatically adjusts the engine timing for easy starting. Just the ticket for aerobats and warbirds alike, the BT-43EI is a powerful, compact alternative to 1.60 glow engines.

SPECS

- **Engine:** Fuji BT-43EI
- **Displacement:** 2.6ci (42.5cc)
- **Rpm range:** 1,200 to 11,000
- **Output:** 4.2hp @ 11,000rpm
- **Weight:** 3.5 lb. (with muffler)
- **Includes:** electronic ignition system, muffler, prop hub, spinner bolt, Champion RCJ6Y spark plug, Walbro HDA222 carb & super-lubricating oil
- **Requires:** unleaded gasoline, 4.8V ignition battery pack
- **Price:** $449.99

Figure 3
Wing structures



chords, always refer to the manufacturer's or designer's recommended balance point. Don't guess! It is very easy for your biplane to end up tail-heavy.

For a more in-depth look at biplane aerodynamics, see Andy Lennon's excellent *Model Airplane News* articles, "Biplane Design—Understanding the Basics" (February 1998 issue) and "Biplane Design Part II" (July 1998).

A BIPLANE'S *WHAT*?

A biplane's decalage can affect its flight yet is often overlooked. "Decalage" refers to the difference in the biplane's two wing incidences or their angles relative to each other and to the fuselage centerline. A positive decalage gives the top wing more incidence than the bottom wing. Negative decalage occurs when the bottom wing has more incidence than the top. Most positive-stagger biplanes (top wing forward of the bottom wing) have positive decalage. In this arrangement, when the top wing stalls before the bottom wing, it causes the model's nose to drop for a natural recovery. If the bottom wing were to stall first, the effect would be to raise the nose, creating a more pronounced stall break.

STRAPPING ON TWO WINGS

Since biplanes produce more drag, they require a slightly higher power loading than monoplanes do. When it comes to the manufacturer's engine-range suggestion, pick one that's at the upper end for added performance. When properly balanced, most biplanes will require only slight up-elevator to break free of the ground during the takeoff roll; some may even require a slight forward stick pressure after takeoff to keep their climb angle shallow. Also, because their wingspans are shorter, biplanes can roll more quickly. For a normal cruise speed, I use about ½ throttle, and then I trim for straight and level flight. Learn to use your rudder to coordinate the turns. The amount of rudder-to-aileron input will depend on the type of model you are flying and its setup.

During landings, use slightly more power than usual, and as always, control your airspeed with small changes in pitch (elevator). The descent rate should be controlled with small adjustments to the throttle. Keep your biplane's nose pointing downward slightly to maintain adequate airspeed.

FIRST PICKS

For the first-time biplane pilot, I recommend a plane with only two ailerons and a semisymmetrical airfoil. This gives the model a relatively tame roll response and keeps the model's setup uncomplicated. There are no inter-aileron connections to hook up or break down. Fully symmetrical airfoils and four ailerons are most often used on aerobatic models such as Pitts Specials, Knight Twisters and Christen Eagles. Your first biplane should be something like a Stearman PT-17, a Fleet Bipe, or a WW I S.E.5a. All have relatively large wing areas, good stability and moderate response rates. High-performance biplanes should come later because they have quicker responses and higher wing loadings, and they require faster landing speeds.

Whether you like scale or sport flyers, gas engines or glow, the choices are boundless. From classic, early-era civilian designs and modern experimental aerobats to WW I fighters and WW II primary trainers, many ARF and kit-built multi-wing projects are available. Making your selection just might be the toughest part of getting started.

Remember, biplanes aren't any more difficult to fly than other models; they just require slightly different flying techniques!

See the Source Guide on page XXX for manufacturers' contact information.

>Hobbico Frequency Checker

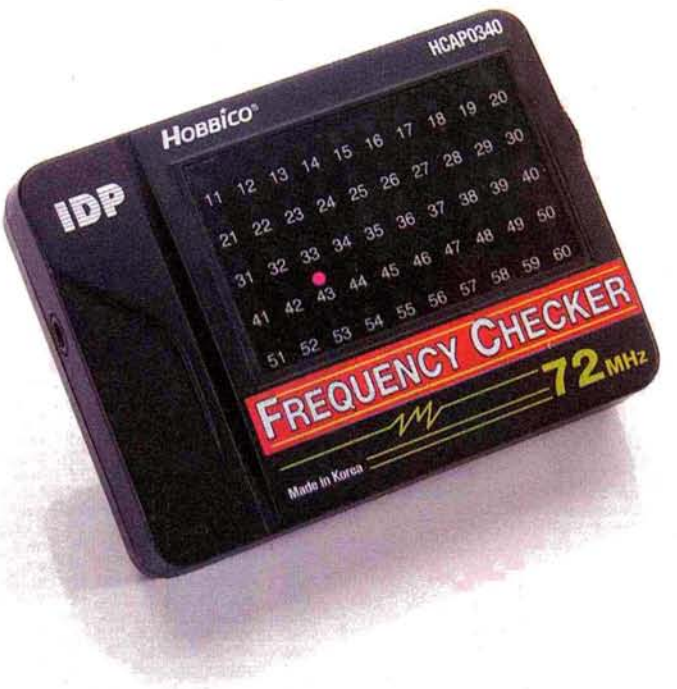
Personal 72MHz insurance

Knowledge is power. I'm not sure who coined that phrase, but it surely is true when it comes to RC model events and frequency control. Clubs across the country rely on the honor system and a rudimentary frequency-pin display to provide basic ground control for radios. If only you could check the airwaves yourself before you turn on your radio .... Now you can!

The new Hobbico Frequency Checker is compact enough to carry in your pocket, and it automatically scans all 50 RC channels in the 72MHz spectrum. Powered by three AAA batteries, the unit has 50 LEDs that individually light up during the scanning process. If a frequency is in use, its corresponding LED remains lit, and the scanning continues until you turn the unit off. It takes approximately 15 seconds to scan all 50 channels.

I used the Checker at my local flying field, and without the optional antenna (sold separately for $8.99), it has an effective range of approximately 300 feet. At the flying station, it easily picked up all the transmitters in use by the other pilots. When you add the plug-in antenna, the range increases to approximately 750 to 800 feet. Used with the antenna, the unit is ideal for monitoring flightline channels used from the radio impound at an event. I like the unit so much that I plan to use it at my upcoming biplane event. You just can't beat it for basic "OK, the coast is clear" insurance before you turn on your radio. Even if you have the frequency pin, it doesn't mean that someone else isn't on your channel!

After using this unit a few times, I think it is a field accessory that we should have had years ago! How much is your peace of mind worth? Priced at $49.99, the Hobbico 72MHz Frequency Checker should be on everyone's must-have list! (A 75MHz Frequency Checker is also available.) *—Gerry Yarrish*



Hobbico; distributed by Great Planes (217) 398-6300; (800) 682-8948; hobbico.com.

^RC Electronics Inc. Watt's Up Meter and Power Analyzer

See what's going on in your system

If you're an electrics enthusiast, you need to be able to fine-tune your plane's power system to maximize its performance or to avoid overtaxing the components. The Watt's Up Meter and Power Analyzer is just the tool for you, as it quickly and easily measures most of the parameters that define your model's performance.

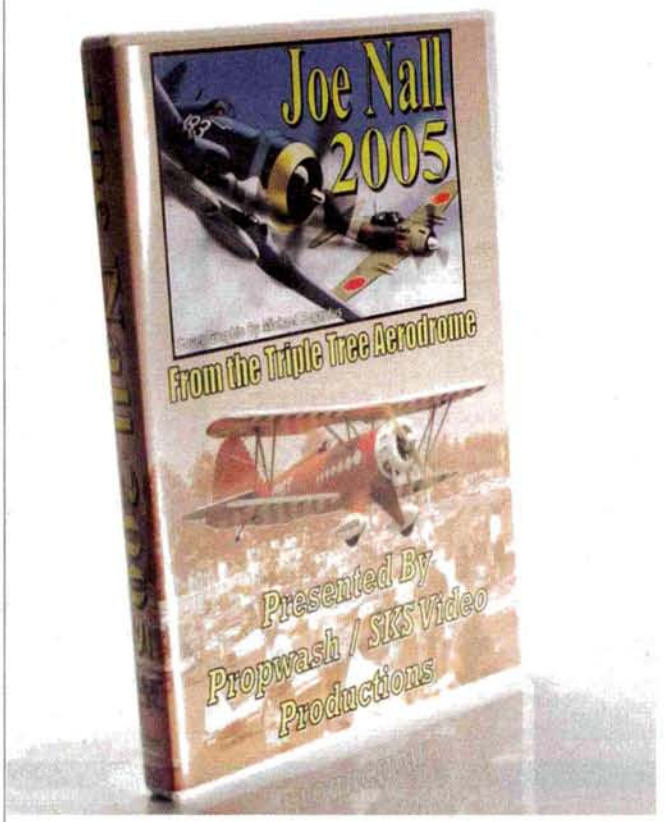
It's small and compact (weighs only 2.4 ounces!), so you can keep it in your flight box or in your pocket for quick and easy access. You can also attach it to your model for in-flight data. The meter measures from 4 to 60 volts and can measure up to 50 amps continuously and up to 100 amps in short bursts. A neat feature of the Watt's Up is its ability to measure fewer than 4 volts by plugging in an auxiliary battery to the built-in port. This is great for measuring single cells so you can compare them and balance your packs. The Watt's Up is supplied without connectors; use whichever kind you prefer.

An LCD shows volts, amps and watts. The meter also captures charge or discharge amp hours, watt hours and peak power. The included "pocket" manual is detailed and describes various ways to use the meter. A downloadable 29-page manual offers instructions and more usage ideas.

You can also use the Watt's Up to see how much charge a battery takes by connecting the battery on the "load" side of the meter and your charger to the "source" side of the meter. When I tested it in this configuration, the number of amps that the charger said went into the battery was nearly identical to the number that the Watt's Up displayed.

If you're looking for a versatile way to measure voltage, current, power, energy and amps, the Watt's Up is the perfect tool. It requires no setup other than soldering on a set of connectors, and it comes in several colors. It costs $59.95. *—Rick Bell*

RC Electronics Inc. (408) 705-1980; rc-cars-planes.com.



Propwash/SKS Video Productions Joe Nall 2005 DVD

Better than being there ... almost!

Most modelers who have invested some time in the hobby know that one of the best—if not *the* best—events in the country is the Joe Nall Giant Scale Fun Fly; it certainly is the biggest! The 23rd annual event was held in 2005 at the famous Triple Tree Aerodrome in Woodruff, SC, and was hosted by Pat and Mary Lou Hartness. It combined the efforts of many volunteers from the Confederate Air Farce RC Club as well as Kirby and Carol McKinney, Mike Gregory and Bob Sadler.

This 100-minute-long DVD represents the seventh year that Propwash/SKS has covered the event. As with all of this company's products, the Joe Nall 2005 DVD is highly professional, and it's well edited with a musical intro and a very convenient "Chapters" navigation feature. Simply drop it in your player, and the controller pops up on the screen. You can play the DVD in its entirety, or you can jump from chapter to chapter by clicking the mini screens shown within the main display.

Many pilots are interviewed, and each is presented with an intro, close-ups of his airplane, a few well-edited flight shots and a landing. Each pilot introduces his airplane, explains where to buy it, what's under the hood and which radio gear he used. Just sit back and get educated! There's enough information about airplane setup to satisfy any armchair pilot.

Featured pilots include Larry Alles with his 118-inch, Ziroli-designed B-25 and John Kohler and Jason Shulman flying John's Great Planes Matt Chapman CAP 580. Many manufacturers are interviewed, including Andreas Gietz, who showed off his impressive Oracle Pitts Model-12 powered by a DA-150. Highlights of the half-time show include Curtis Youngblood flying his amazing JR Vibe 90 helicopter, Bob Violett flying his turbine-powered F-86 and an impressive prize bomb-drop sponsored by Hobby Lobby. Instead of candy, the plane dropped plastic eggs filled with more than $1,200 worth of goodies, including brushless motors and other E-power accessories.

If you have never attended this "Oshkosh of RC" event, check out this DVD, which costs $19.95. You'll soon be motivated to pack your bags! —*Gerry Yarrish*

Propwash/SKS Video Productions; propwashvideo.com.

Tower Hobbies Ultra Slim Glow Starter

In-your-pocket go-power!

Let's face it: you simply can't live without a good glow-plug driver/starter. Even if you have the most sophisticated power panel with a computer-controlled glow-plug-driver cord, it won't help you when your model's engine conks out at the end of the runway. What you need is that old, reliable, in-the-pocket plug energizer for that occasional quick-flip start!

The Tower Hobbies Ultra Slim Glow Starter is made of aluminum with a classy purple-anodized finish over a sure-grip knurled finish. The machined endcap screws into the ¾-inch-diameter body and has the battery contact spring in it. The plug receptacle is spring-loaded to lock over the plug with a ¼ twist. The overall length of the unit is 4 inches. Powered by a fresh Duracell alkaline AA battery, my Ultra Slim worked flawlessly all weekend long at a recent fly-in. For the modeler who has everything, this neat flightline must-have is priced at $11.95. It fits almost anywhere! —*Gerry Yarrish*

Tower Hobbies (800) 637-4989; towerhobbies.com.

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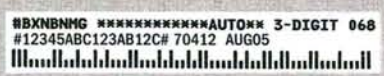

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BY GERRY YARRISH > PHOTOS BY PAUL LeTOURNEAU

A monstrous Mitchell bomber

Each bomb is the size of a 2-liter soft-drink bottle.

Custom Robart retracts support the big bomber.

SPECIFICATIONS

Model: TB-25J 1/5 scale
Span: 162 in.
Length: 138 in.
Engines: DA100 twin gas
Props: 26x10 3-blade Viela
wood-core gelcoat finished

A TRUE BELIEVER THAT "BIGGER IS BETTER," Paul LeTourneau of Oconto, WI, should be called the "ultimate Mr. Big!" Everything in his RC hangar is of gargantuan scale. One of his most impressive projects is a model he campaigned though the 2005 flying season—a 1/5-scale, scratch-built TB-25J. This model is a 62-percent enlargement of Nick Ziroli's 101-inch-span plane, and it spans an impressive 162 inches. But that isn't all that's truly noteworthy.

Paul spent two winters building this behemoth of a bomber, and it weighs in at a healthy 96 pounds and requires an AMA waiver to fly at airshows. Paul used traditional balsa, lite-ply and aircraft plywood for most of its construction, and he finished it with 1/2-ounce fiberglass cloth and Z-Poxy finishing resin. He made all the plugs for the many vacuum-formed parts, including the gun turrets, the cockpit canopy and the bombardier's greenhouse. Surface details are all there, including raised and flush rivets and panel lines and many access panels and hatch covers.

Interior hardware includes a pair of 32-ounce fuel tanks that provide 11-minute flights with two DA-100 twin-cylinder "boxer" engines. Paul uses a JR 10X transmitter with 22 servos: one each for the elevators, one each for the two rudders, one for each aileron, two for throttle, four for each flap section, and one each for brakes, the retract valve, the landing-light switch and bomb-bay-door operation and four for bombs. RAm lights are used throughout, and Frank Tiano Enterprises dummy radial engines nicely fill the fiberglass engine cowls. Paul exclusively used Zap CA and standard Du-Bro flat hinges. The B-25 has plug-in outer wing panels to ease transportation logistics.

The entire project depends on strong, reliable retracts, so Robart Mfg. custom-made the mammoth gear. They are actuated with industrial-grade air cylinders. Custom Sierra rims and brakes and 9.5-inch-diameter ultralight aircraft tailwheels round out the main gear, and a Robart 6-inch nosewheel provides the steering. There are 10 onboard air tanks: six large tanks for the main gear, two medium tanks for the bomb-bay doors and two small ones for the brake system. Access to everything in the interior is fairly simple, as the large bomb-bay doors provide a convenient entry to the model's interior.

When asked why he built such a large bomber, Paul casually replied that everyone he flies with has 1/5-scale warbirds, so he wanted a bomber in the same scale! We can see why, Paul; your mighty Mitchell is very nicely done.